THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

COMPUTERWORLD

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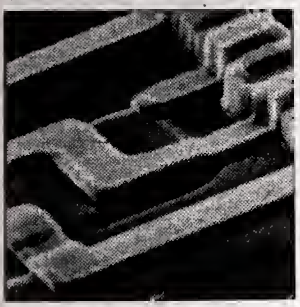
Family tree
The life and times
of IBM/**99**



In Depth
Inside IBM's
research center
ID/2

In Depth
The power
of fourth-
generation
languages
ID/19

TRW launches broadband local-area net

By John Dix
CW Staff

TORRANCE, Calif. — TRW, Inc. last week announced its first commercially available broadband local-area network, said to support full-duplex, RS-232 asynchronous communications between terminals and hosts at 2M bit/sec.

Devices within the broadband Concept 2000 contend for the network using the carrier-sense multiple access method. Up to 20,000 users can be accommodated on a single network, the company reported.

Later releases of the network will support synchronous traffic, and according to J. Edward Snyder, general manager of the TRW Information Networks Division, gateways are being developed to Ethernet, IBM's Systems Network Architecture and X.25 protocols.

Products currently available with the TRW Concept 2000 include the following:

- Intelligent Connector Units that support devices at speeds up to 19.2K bit/sec, come in two- and four-port versions and

See **TRW** page 6

IBM rolls back micro prices

Do reductions signal imminent PC2 arrival?

By Eric Bender
CW Staff

BOCA RATON, Fla. — IBM last week lowered prices across most of its Personal Computer line and introduced two models of the Personal Computer XT.

The price cuts, which range up to 12% on systems and 16% on peripherals, affect the Personal Computer, Personal Computer XT, Portable Personal Computer, 3270 Personal Computer and Personal Computer XT/370 models (see chart page 6).

Industry analysts considered the announcements relatively small adjustments to IBM's microcomputer marketing strategy and noted that the price drops had been widely anticipated. Many observers suggested that IBM's next major move will be the debut of the much-rumored PC2, a low-end version of the Personal Computer AT, sometime this summer.

IBM "added a little pizzazz to the XT, repositioned the Personal Computer modestly and held off on other announcements,"

See **IBM** page 6

TOP OF THE NEWS

Apollo Computer unveiled software that is said to allow two popular versions of AT&T Unix — University of California at Berkeley 4.2 and System V — to run separately or simultaneously on a workstation. **Page 7.**

■

Simplified microcomputer-mainframe links and better integrated packages will lead the coming wave of microcomputer software, according to attendees' predictions at Softcon. **Page 11.**

SOFTCON

■

To date, IBM has announced just one product — an adapter for a communications controller — for users of T1 digital communications facilities. **Page 91.**

■

Prime results. An early user of Prime Computer's 9955 superminicomputer found that the machine not only met but in some cases also exceeded Prime's performance claims in benchmark tests. **Page 99.**

■

CDC will trim its work force by an unspecified number of employees to cut costs, blaming the action in part on its ownership of one of Ohio's troubled savings and loan institutions. **Page 107.**

Micro graphics offer low-cost presentations

By Eric Bender
CW Staff

Across the U.S. at any given moment during the business day, scores of more or less enthralled audiences are sitting through presentations. Graphics created on personal computers offer the promise of inexpensively making these common, crucial yet often boring events much more productive.

PRODUCT SPOTLIGHT

In medium to large corporations, people are particularly likely to make presentations, and everyone wants to look good in front of an audience, according to David Tarrant, vice-president for applications products at Graphic Communications, Inc. in Waltham, Mass.

Microcomputers provide alternatives for many whose only other option has been "simple and not very satisfactory [overhead transparencies]," he said. Users can create their own graphics at a fraction of the cost that internal graphics departments or outside firms charge. In addition, confidential material can be guarded more closely.

Micro-based presentation graphics "save me a great deal of time," said Susan Taggart, marketing communications manager for Cycare Systems, Inc. in Dubuque, Iowa. One major advantage for Cycare, which handles data processing for medical groups, is the ability to update the firm's product slides quickly, she said.

Graphics has been "a late bloomer among productivity packages," but interest is building as more effective packages, high-resolution monitors and less expensive output devices become available, commented Peter Higgins, group product manager for planning products at Microsoft Corp. in Bellevue, Wash.

Today, most potential users lack expertise with computers, cameras and graphic

See **GRAPHICS** page 9

FYI

Outspoken micros keep support center humming

By John Gallant
CW Staff

NATICK, Mass. — "Transaction number three in the R&D start-up took 19 seconds. The threshold is 5 seconds."

The emotionless, metallic voice, intermittently echoed by three other synthesized human voices, drones out a warning of degrading applications response time. With tireless vigilance, the voices rise and fall in a bizarre litany of computer system problems.

Surely this must be a vision from a DP manager's nightmare — the computers are talking back. Like predatory end users, they sound off as each problem arises.

But the scene was not stolen from the dream-ravaged sleep of an MIS executive. Rather, it is repeated every day at McCormack & Dodge Corp.'s technical support center at the software vendor's headquarters here. At the center, IBM Personal Computers, equipped with Votrax, Inc. voice synthesizers, are linked to what Dean Redfern, M&D's director of computer services, labeled critical mainframe applications. Emulating terminal users, the micros — dubbed PC Robots — routinely fire off transactions to the applications and sound out a warning when response time exceeds defined parameters, when an abend occurs or when a file is erroneously closed.

Thus, Redfern said, support center staff members are aware of systems problems and can initiate corrective action before they receive a telephone call from a dismayed user awaiting the return of the cursor or from a disgruntled sales representative faced with a failed product demonstration.

Currently, the outspoken micros are tied into four major on-line applications

See **VOICES** page 4

NEWSPAPER

AT&T competitors to pay by minute

FCC orders dropping of discounted flat-rate charge

WASHINGTON, D.C. — The Federal Communications Commission will require AT&T's largest competitors in the long-distance telephone business to pay local telephone companies for their actual minutes of use rather than the flat discounted fee they have been paying.

Starting Jan. 1, 1986, MCI Communications Corp., GTE Sprint Communications Corp. and Satellite Business Systems will face increased line costs based on actual minutes of use to reach their customers through the local telephone company lines, although they will still be paying less than AT&T.

Currently, the flat-rate charges paid by the largest long-distance carriers to the local companies are based on an average of 9,000 minutes of use monthly per line.

Proponents of the change to actual-usage fees said the larger companies were using local lines more than the average 9,000 minutes monthly and therefore were getting more than the 55% discount.

Costs for smaller companies

Smaller long-distance companies, such as Lexitel Corp. and Allnet Communications Services, Inc., which have reported less usage than the 9,000 minute average, will have their connection costs lowered, according to Albert Halprin, chief of the FCC's Common Carrier Bureau.

The FCC action comes as GTE Sprint has raised questions about the speed of the FCC's deregulation agenda following the divestiture of AT&T in January 1984 that is resulting in increased costs for access.

GTE Sprint recently claimed that the future of a competitive long-distance market may be in "severe jeopardy." The GTE Sprint statement was issued with a report on the future of the long-distance market by the consulting firm of Booz, Allen & Hamilton.

Upgrade beats IBM DOS/VSE delivery

RYE BROOK, N.Y. — IBM users awaiting initial shipments this month of DOS/VSE 2.1, which was announced a year ago [CW, April 23, 1984], have been offered an enhanced version of that release that includes support for 4K-byte paging under VM.

IBM last week announced DOS VSE/SP 2.1.1, which provides significant modifications to VSE/SP 2.1. The support for 4K-byte paging in IBM 370 mode, an enhancement from 2K-byte paging, means that DOS/VSE can run as a guest operating system under VM on the IBM 4381 Model 3 and on 3080 series processors, which support only 4K-byte paging.

The 4K-byte paging also allows native VSE/SP 2.1.1 to use full cache storage on the IBM 4381. Previous releases used only half the 4381's cache storage.

The announcement ends speculation on whether IBM would support 4K-byte paging in the new version of DOS, which is used by nearly 47% of IBM mainframe users, according to the Framingham, Mass.-based market research firm International Data Corp. In its announcement, IBM referred to VSE/SP 2.1.1 as a "major step forward in the evolution of VSE."

VSE/SP 2.1.1 also supports IBM's recently announced 3380 Models AD4 and BD4 disk drives [CW, Feb. 11] and the 3270 Extended Data Stream to make use of highlighting, extended colors and load-programmed symbols of the 3270 display system. The enhanced version also supports 3290 large screens for user programs running in interactive partitions of ICCF and the autostart and programmable power-off features of the IBM 4361.

All functions of the previously announced but not yet delivered VSE/SP 2.1, including an increase in virtual address space of 16M bytes to 40M bytes, are included in the enhanced version, an IBM spokeswoman said.

In addition, IBM has discontinued support for its 3203 Models 1 and 2 and 5203 printers, which had attached to IBM 370 Models 115 and 125 processors. Support for those processors was discontinued with the announcement of VSE/SP Version 2.

The full-function VSE/SP 2.1.1 is priced at $48,500 for a basic license and $43,650 under the distributed license system option. The charge to upgrade from full-function production VSE/SP 1.1 to VSE/SP 2.1 is $8,090. The charge for upgrading from SSX/VSE to VSE/SP Version 2.1.1 is $36,730 for a basic license and $33,057 under the distributed license system option.

More information is available from IBM, 900 King St., Rye Brook, N.Y. 10573.

Give us a buzz

Hard as we try to give our readers the most complete information available, some good news and feature stories never reach us.

Are you involved in an unusual application of DP technology in your company? Have you implemented successful cost-cutting strategies? Is something in your DP shop not working as designed? Know any unsung heroes?

Heard any hot news about vendors? Are you aware of technology or management trends the trade press is overlooking?

If so, we'd like to hear from you. *Computerworld* has established a reader hot line for information regarding items of interest to the computing community. Call us toll free at (800) 343-6474. Ask for Donovan White, assistant managing editor.

We can't be everywhere — but our readers are.

CORRECTIONS

In "Cash registers to mainframes" [CW, March 18] the development of NCR Corp.'s 304 processor was a joint venture between NCR and General Electric Co., not NCR and Westinghouse Electric Corp. as was reported.

A story on IBM's projected profit decline [CW, April 1] incorrectly reported that IBM's stock price dropped $3.25 the day following the announcement of the 3090 series. The stock dropped on the first day of trading following IBM's announcement that profits were expected to decline for the first quarter.

"Computer museum, graphics firm to sponsor contest" [CW, April 1], incorrectly stated a segment of the rules for a computer-generated graphics contest sponsored by the Boston Computer Museum and Raster Technologies, Inc. The story should have read: "Entries must not contain identifying information that will allow the judges to determine the source of the entry."

It was incorrectly reported [CW, Feb. 25] that Software Design Associates, Inc. had acquired Systems Strategies, Inc. Systems Strategies was acquired by AGS Computers, Inc., which is the parent company of Software Design Associates.

General Electric Information Services Co. reported that character charges for its Marknet 3270 Binary Synchronous Communications service range from 1 cent/1,000 char. to 2.5 cents/1,000 char., not to 25 cents/1,000 char. [CW, March 25].

NEWS SUMMARY

DG has added a multiuser micro for AT&T Unix software development to its Desktop Generation line of personal computers/**4**

Although the U.S. and Japan are searching for ways to resolve their differences over trade imbalances, the U.S. Congress has passed resolutions to threaten to impose trade barriers for Japanese products/**4**

Apollo Computer has announced software that reportedly combines Berkeley 4.2 and System V versions of Unix on a 32-bit workstation, allowing the coresident operating systems to run either separately or simultaneously/**7**

CW at Softcon: Better integrated packages and simplified microcomputer-mainframe links will lead the next wave of micro software, conference visitors predicted . . . Debate continued over the best approach to dealing with software piracy, but there was little doubt that the problem will continue to grow . . . Micro-mainframe links were seen as a prelude to the micro-mini-mainframe links of the future . . . Two speakers offered ideas on how to manage micros in the corporate environment/**12-14**

U.S. negotiators have reached a preliminary agreement with European countries concerning transborder data flow/**15**

Companies in the EFT industry must take an assertive stand on telecommunications issues, speakers maintained at the annual Electronic Funds Transfer Association convention/**18**

The results of benchmark testing on programming productivity were released at a recent forum/**22**

Office automation offers women multifaceted career opportunities, according to a speaker at a recent Association for Women in Computing seminar/**25**

Communications specialist positions can be good career paths for women in the 1980s/**26**

Wire service machines in radio and television network newsrooms are being switched off and replaced by electronic newsrooms/**28**

As the first network to use an electronic newsroom system; the Cable News Network has found that it has developed an edge over the other major news networks/**29**

In Cambridge, England, a quiet high-tech explosion has been under way, one that has been ignored by the British government/**32**

Prime Computer solved a taxing problem with a software package that helped automate its tax computations/**38**

IN DEPTH

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DG multiuser micro targets Unix software development

By Edward Warner
CW Staff

WESTBORO, Mass. — Responding to what it said was a cry for more Unix applications, Data General Corp. last week announced Model 45, a multiuser workstation for Unix software development.

A part of DG's Desktop Generation product line, the Model 45 will incorporate two microprocessors, the DG Microeclipse and the Motorola, Inc. 68000. The Motorola chip will run applications developed under the Model 45's Desktop/UX operating system, a native version of Unix based on AT&T's System V. The Microeclipse processor, meanwhile, will handle I/O, system calls and interrupts, reportedly speeding program execution. The DG chip also supports Desktop Generation printers, terminals and storage devices, including a 71M-byte hard-disk storage unit introduced for the line last week.

Up to two of the 71M-byte disks reportedly can be connected to models in the Desktop Generation line, including the Model 45.

Also among the DG rollouts was a streaming tape cartridge, reportedly containing 550 feet of tape and offering backup of 18.7M bytes.

The basic configuration of the Model 45 reportedly consists of 512K bytes of random-access memory (RAM), one diskette drive, a 15M-byte disk storage unit and support for up to eight users. At the upper end, the unit can be configured with up to 4M bytes of RAM and a 142M-byte disk, providing support for up to 12 users.

Desktop/UX is said to be an implementation of Unisoft Systems Corp.'s Uniplus+ operating system and reportedly supports the System V software library. It reportedly includes the standard Unix Bourne and C shells, a C compiler and upward mobility with DG's DG/UX, the native Unix for DG's line of 32-bit superminicomputers. For telecommunications, it supports the TCP/IP and Unix-to-Unix networking protocols.

In its basic configuration, the Model 45 costs $11,845. A license for Desktop/UX costs $1,800; a TCP/IP license costs $750. Both the Model 45 and Desktop/UX are said to be available within 90 days of DG's receiving an order. The 71M-byte disk storage unit costs $7,995. The 18.7M-byte tape cartridge costs $45.80.

Chris Saleh, product manager for DG's Technical Products Division, referred to the Model 45 as a "low-end, entry-level Unix development box." While noting the dissimilarities among the Model 45, the IBM Personal Computer AT, which can run a version of Unix System III, and the AT&T Unix PC, which runs Unix System V, Saleh said the availability of Unix on personal computers is creating a demand for Unix applications.

DG is located at 4400 Computer Drive, Westboro, Mass. 01580.

VOICES

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that impact nearly all of M&D's 1,200 employees, Redfern said. The systems include a demonstration application that supports sales and marketing personnel across the country; a customer training system linked via an IBM Systems Network Architecture network to education centers in Natick, Chicago, Los Angeles and Huntsville, Ala.; a dedicated IBM CICS environment supporting software developers; and what Redfern called a corporatewide support system that includes capabilities such as electronic mail.

According to Steven Colbert, senior tools consultant and developer of the PC Robot software, the micro monitors are linked via coaxial cables to M&D's networked mainframes. The Natick data center operates an IBM 4341 and a 3081G, as well as a National Advanced Systems Corp. AS/9060 mainframe.

Like M&D's users, the PC Robots have access to a variety of environments, including IBM's MVS, MVS/XA, VM/SP, DOS/VE, IMS, CICS, DB2 and other vendors' software.

The PC Robot software was based on M&D's Interactive PC Link system. In addition to emulating a transaction-initiating end user and emitting synthesized alerts, the micros calculate response times, maintain a history of them and chart the results for service-level comparisons.

In addition to the four PC Robots that currently maintain the support center, the company recently installed a PC Robot at the Huntsville education center to monitor network- and communications-related delays.

"Before we installed the [PC] Robots," Redfern said, "we were in the traditional reactive mode. There would be a problem, and we would get a phone call from a user.

"Now we are in a proactive situation. We know first. We can say we are aware of the situation, and we expect to have it resolved within a certain period of time. Users feel more comfortable. In fact, the number of calls to the help desk from all types of users has dropped significantly. Users know we are on top of problems," he said.

Technical Support Manager Edward McGowan said the PC Robots can raise quite a din in the narrow confines of the support center, especially during peak processing periods when response time can slip.

But, he confided, the voice synthesizers can be turned down, and the staff often ignores alerts if the response-time degradation is only a temporary, expected occurrence.

Redfern said M&D plans to expand the PC Robot project to monitor all on-line applications. Currently, Colbert is researching methods for programming the micros not only to complain but also to take corrective action where possible.

"Micros are a programmable black box," Redfern said. "They can do more than just spreadsheets. We have a $12,000 investment in micros babysitting a $15 million data center."

U.S.-Japan trade agreement reached, but Congress remains wary

WASHINGTON, D.C. — U.S. and Japanese trade officials last week said that agreements to permit easier entrance for U.S. manufacturers into the Japanese telecommunications market have been reached and will will be unveiled by the Japanese April 7.

However, members of U.S. Congress continued to express skepticism over the latest trade liberalizing agreements. Two weeks ago, the U.S. Senate, in a 92:0 vote, called on President Reagan to retaliate against Japan by curbing imports if Japan does not eliminate entry barriers to its own markets.

Last week, the Senate Finance Committee passed a bill giving President Reagan 90 days to obtain increased access to Japan's markets or to ban Japanese imports.

U.S. trade officials have regularly announced progress in trade liberalizing agreements they have reached with their counterparts only to find later that the policies are not carried out by Japanese bureaucracy.

The Reagan administration moved to dampen lawmakers' criticism of Japan's policies by asking them to wait and see exactly what steps have been taken. At the same time it is using congressional displeasure with the trade issue to pressure the Japanese government to take action.

The Reagan administration has held out the possibility that the Federal Communications Commission could restrict entry of Japanese communications products to the U.S. through denying certification for connection to the nation's telephone system. However, officials are sensitive to the possibility that this action could lead to Japanese retaliation.

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SUSPENSE

How did IBM's rookie sort (Rel 7.0) do in its first meeting with "Lefty" SyncSort? Read all about it!

or Call (201) 568-9700.

Get the inside scouting report.

It is one of those historic moments in the Annals of Sort! The very first appearance in competition of IBM's new DFSORT, Release 7, in the tough-as-nails MVS/XA League. Will the kid be able to live up to his advance press notices?

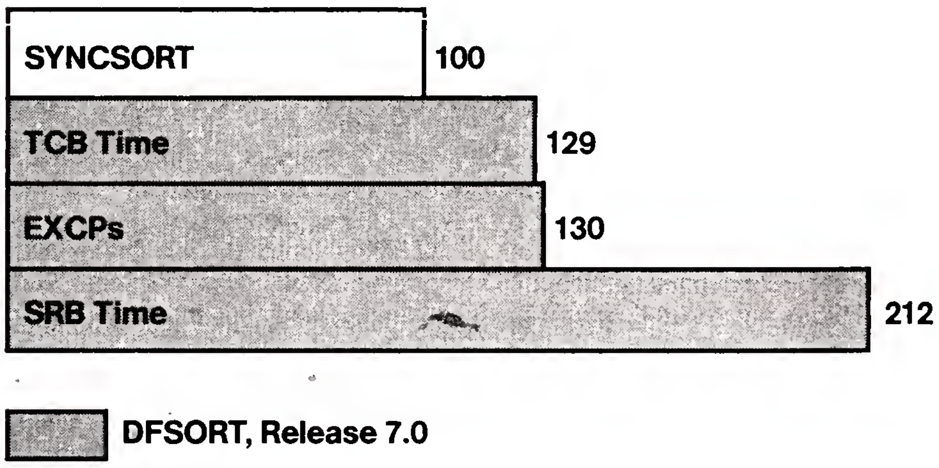
Confidently DFSORT7 strides to the plate… knocks the dirt out of his spikes… hitches up his britches… raises his sort assists.

Then, as sorting fans everywhere gasp in amazement, he lifts his arm lazily and points toward the centerfield flagpole, thousands of bytes away. The kid is going to try to emulate Babe's mighty homerun shot!

Moments later, SyncSort winds up… a curving white blur is seen… and… and…

There is no joy in Armonk! DFSORT7 struck out every time it came to bat against the latest release of SyncSort (Release 2.SE) in a recent series of MVS benchmark tests. (In sorting, as in most other forms of human endeavor, it's a long way from *baby* to *Babe*.)

The bar charts below tell the story more eloquently than we can:



That didn't surprise us too much. **After all IBM isn't known for its sorts… and we're not known for our computers.**

We stick to what we do best. Maybe some day they will too. But in the meantime, you're faced with a choice of sorts. You can use their sort, which gets the job done (eventually). Or you can use our sort. We're a little faster. (We're also very modest.)

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IBM from page 1

commented Michael Geran, vice-president of research at E. F. Hutton & Co. in New York. "You have to move the old stuff before you can sell the new stuff."

Available immediately, the two Personal Computer XT systems differ from standard models only in their lack of a built-in hard disk drive, an IBM spokesman said. The systems, which can accept an optional 10M-byte hard disk drive, are designed to offer a more flexible upgrade path than that offered by a standard Personal Computer, he said.

One model with 256K bytes of random-access memory (RAM) and a single 360K-byte diskette drive will cost $2,270, while a similar version with two diskette drives will cost $2,570.

In addition to the price cuts detailed in the chart, IBM dropped the cost of a Personal Computer with 64K bytes of RAM and two floppy disk drives from $2,240 to $2,115. Cost of a comparable single-disk-drive system, however, rose from $1,265 to $1,390. The cost of the Personal Computer XT/370 was reduced from $8,395 to $7,895.

Costs of 3270 Personal Computer models also dropped slightly: the Model 2, from $3,785 to $3,745; the Model 4, from $4,650 to $4,485; the Model 6, from $6,210 to $5,710; the Model 24, from $5,990 to $5,825; and the Model 26, from $7,550 to $7,050.

In addition, pricing on enhanced graphics 3270-PC models fell: the G/GX Model 12, from $4,130 to $4,090; the G/GX Model 14, from $4,755 to $4,590; and the G/GX Model 16, from $6,580 to $6,080.

For more information, IBM Entry Systems Division is located in Boca Raton, Fla. 33432.

IBM PERSONAL COMPUTER PRICING CHANGES

System Units (with Keyboard)	Now	Formerly
Personal Computer, 64K-byte	$ 1,390	$ 1,265
Personal Computer, 64K-byte with two 360K-byte diskette drives	$ 2,115	$ 2,240
Personal Computer XT, 128K-byte with 360K-byte diskette drive, 10M-byte fixed disk drive, asynchronous communications adapter	$ 3,775	$ 4,275
Personal Computer XT, 256K-byte, two 360K-byte diskette drives, 10M-byte fixed disk drive, asynchronous communications adapter	$ 3,895	$ 4,395
Portable Personal Computer, 256K-byte with two 360K-byte diskette drives	$ 2,895	$ 3,020
IBM Hardware Options		
10M-byte Fixed Disk Drive	$ 1,195	$ 1,395
Fixed Disk Adapter	$ 495	$ 590
Personal Computer Expansion Unit	$ 2,585	$ 2,880
Personal Computer XT Expansion Unit	$ 2,090	$ 2,290

SOURCE: IBM; CW CHART

In addition to the price changes shown, costs for 64K-byte versions of IBM Personal Computers and all 3270 Personal Computers models were altered. Pricing did not change for the Personal Computer AT, and other options such as memory add-ons were not affected, an IBM spokesman said.

TRW from page 1

reportedly can be used with single or dual-cable networks with one or four channels. The modular ICUs contain a power supply; a Zilog, Inc. Z80-based board that provides addressing, protocol handling and buffering; and a radio-frequency modem.

A dual-port ICU costs $1,195 and a four-port ICU costs $1,595. The same devices outfitted with frequency-agile modems — permitting attached devices to access up to four 6-MHz network channels — cost $1,595 and $1,995, respectively.

■ The Multiport Intelligent Connector Unit, a rack-mounted or standalone network interface unit, can support up to 32 serial asynchronous ports.

All ports can share the same modem and power supply, Snyder said, and attached devices can communicate without being routed through the network. A 32-port ICU costs $12,119.

■ The Network Monitor, based on a Digital Equipment Corp. PDP-11/23 with the Ultrix 11 operating system, is said to monitor the activity and performance of ICUs and/or cable plant status for small to mid-size networks. Both capabilities cost $5,000 each.

■ The System Control/Monitor, a $15,000 software package for DEC VAX 11/730s, provides monitoring and control of all ICUs and cable plant information for large networks. Management data is acquired automatically and displayed in color-coded topographical visuals.

■ The Frequency Translator, which is needed for single-cable networks divided into send/receive channels by frequency, costs $3,000 but may be configured with automatic switch-over to a redundant unit for $6,500.

Network starter kit

The company also announced availability of a network starter kit that costs $4,295 and includes plans, necessary cabling and standard ICUs to support eight users.

The TRW Concept 2000 uses 350-MHz coaxial cable and can be used to support multiple subnetworks, Snyder said.

Such a network may support office devices within a certain band of frequencies while simultaneously supporting personal computers on a separate band, Ethernet protocols used in computer-aided design and manufacturing applications on another and perhaps a process control network on yet another frequency band. Bridges permit communication between the bands.

More information is available from TRW's Information Networks Division, 23800 Hawthorne Blvd., Torrance, Calif. 90505.

IBM unveils DB2 dictionary

IRVING, Texas — IBM has announced the Data Dictionary Database 2 interface (DD-DB2), which expands the IBM dictionary's general functions to support IBM's DB2 and aims to improve system and application programmer productivity.

IBM also announced the Plant Automation Communication System for Series/1 minicomputers in industrial automation environments and the Image View Facility (IVF) for VM and DOS/VSE, which allows users to view documents that have been scanned, captured and stored by the IBM 8815 Scanmaster in the IBM 370 Distributed Office Support System environment running under MVS and CICS, DOS/VSE and CICS/VSE.

According to an IBM spokesman, DD-DB2 features a front-end dialogue under IPF, a dictionary model, extension for DB2 support and DB2OUT and DB2IN facilities. The product is written in PL/I and is available for MVS.

The front end reportedly provides for the use of DB2 in IBM's ISPF environment. The DB2OUT facility allows users to output DB2 constructs from the dictionary, and the DB2IN facility allows users to input DB2 constructs from the DB2 catalog into the dictionary.

DD-DB2 is said to improve productivity by using dictionary information for creating, modifying or deleting DB2 objects; by using the DB2 catalog for creating or modifying DB2 objects; and by helping to synchronize dictionary and DB2 constructs.

The one-time charge for DD-DB2 is $4,000; the one-time charge for the Plant Automation Communication System is $8,000. The one-time charge for the VM and DOS/VSE versions of IVF is $5,400 each, with product availability in May.

More information can be obtained from IBM, 5205 N. O'Connor Road, Irving, Texas 75039.

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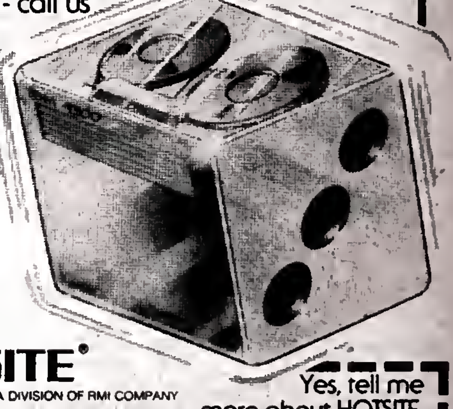

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Apollo tool fuses Berkeley 4.2, System V Unix versions

By John Desmond
CW Staff

CHELMSFORD, Mass. — Apollo Computer, Inc. has announced Domain/IX software that reportedly combines University of California at Berkeley 4.2 and System V versions of AT&T's Unix on a 32-bit workstation, allowing the two Unix standards to run separately or simultaneously as coresident operating systems.

Domain/IX is targeted at Apollo users who want to run 4.2 and System V applications and at software developers who want to support both Unix standards, according to Apollo's Unix product manager Mark J. Hatch.

According to Hatch, the 1983 version of Berkeley 4.2 Unix is incorporated in the product but not in extensions of 4.2 announced since then. Hatch said users are not likely to write programs using both 4.2 and System V, because such applications would be confined to running on Apollo hardware.

Features of Domain/IX include a hierarchical file structure extending across the network, demand paging across a network, a minimum of one disk per network, a range of graphics libraries, support for bit-mapped monochromatic and color displays and support for C, Lisp, Fortran 77 and the International Standards Organization's version of Pascal programming languages.

The Unix file system on Apollo's Domain token-passing ring network appears to all users as a single file structure, although the data may be located on various system nodes.

This feature is said to eliminate the need for file transfer or for duplicate copies of data. With Domain/IX, any workstation or server processor can demand page from anywhere in the network; thus, a local disk is not needed for every workstation.

The four programming language compilers share a common code generator, which allows programmers to combine different programming languages in one application.

The Domain system also supports the Ethernet local-area network, the Department of Defense's TCP/IP protocol for accessing Digital Equipment Corp. VAX series superminicomputers and the X.25 standard protocol. Communication with IBM hosts is possible with software emulating several IBM RJE subsystems. All Domain workstations have RS-232C ports and provide DEC VT100 terminal emulation.

Domain/IX software will run on all nodes in the Apollo family, the firm said. Domain/IX costs $425 per node and $9,100 per site. The price of Berkeley 4.2 alone or System V Unix alone is $300 per node and $6,500 per site.

Apollo is located at 330 Billerica Road, Chelmsford, Mass. 01824.

Special Report to target DBMS

The increased use of multiple data bases and vendor moves toward integrating applications more tightly around a central data base management system are two of the factors that give DP managers something to think about when considering the DBMS issue.

The June *Computerworld* Special Report will focus on DBMS and the continuing evolution of that market. The report will also cover issues of purchasing and maintaining the corporate data base.

Contributions to the Special Report are welcome and should take one of two forms: a tutorial article discussing an issue or trend or an application story outlining a particular user firm's experience with a DBMS.

Articles must be typed, double-spaced and range in length from four to six pages. Artwork, such as charts, graphs and photographs, is welcome.

Authors should include a brief biography and a telephone number at which they can be reached.

The deadline for submissions to the Special Report is May 5.

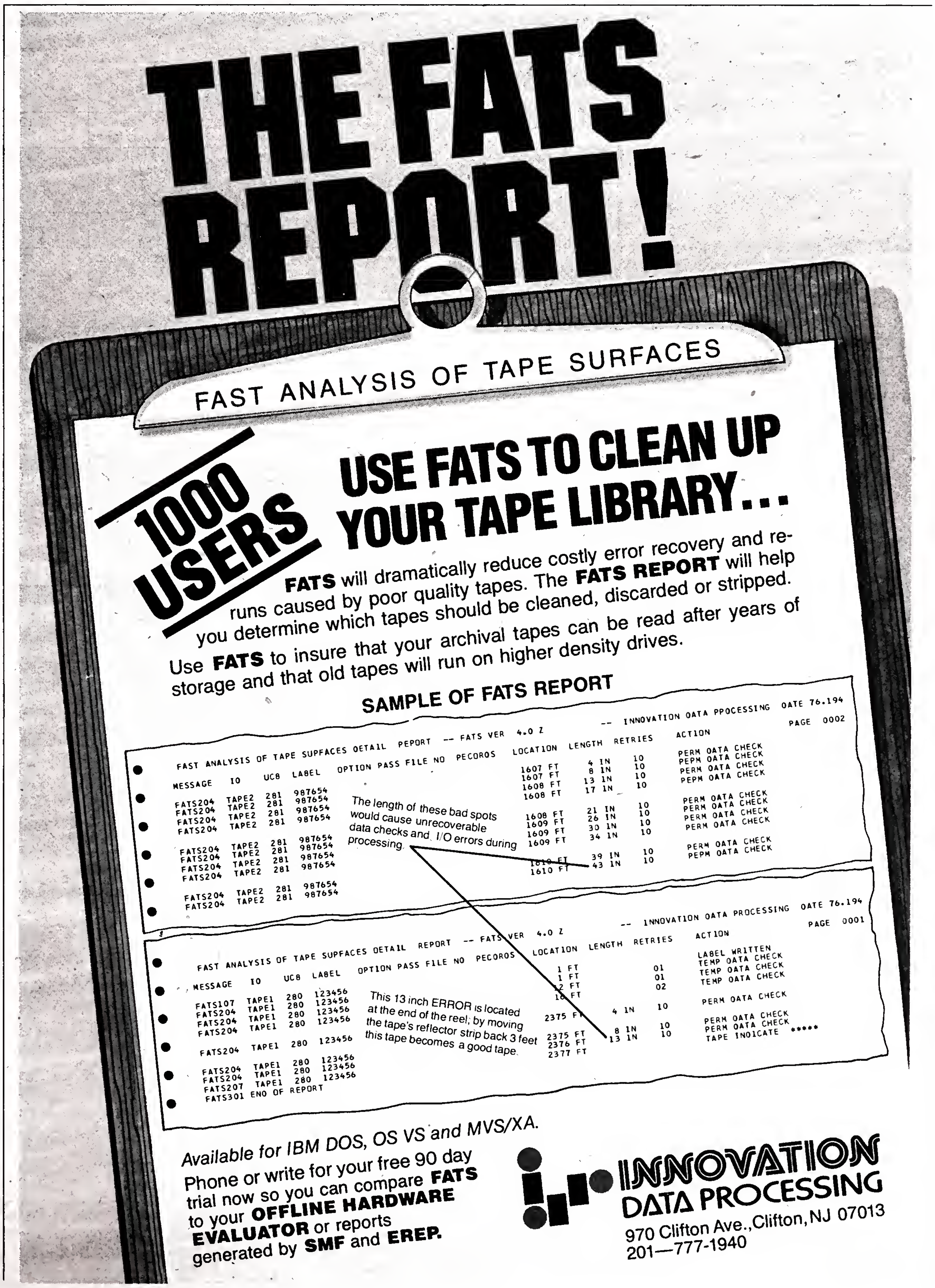
If you have a story or any questions, send them to Janet Fiderio, Special Reports Editor, *Computerworld,* Box 880, 375 Cochituate Road, Framingham, Mass. 01701.

OA conference slated for June

WASHINGTON, D.C. — Syntopican XIII — the Association of Information Systems Professionals' (Aisp) annual office automation/information systems conference and exposition — will be held at the Convention Center and the Mayflower Hotel here June 17-20.

The conference theme is "Making Business Systems Effective."

Registration fees are $425 or $325 for Aisp members. Registration before April 30 costs $30 less. More information can be obtained from Aisp Conference Services, 1015 N. York Road, Willow Grove, Pa. 19090.



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 MESSAGE   IO     UC8  LABEL   OPTION PASS FILE NO  PECOROS
                                                              1607 FT     4 IN     10       PERM OATA CHECK
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 FATS204  TAPE2  281  987654                                  1608 FT    13 IN     10       PERM OATA CHECK
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The length of these bad spots would cause unrecoverable data checks and I/O errors during processing.

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 FATS204  TAPE1  280  123456                                     1 FT               01      TEMP OATA CHECK
 FATS204  TAPE1  280  123456                                    12 FT               02      TEMP OATA CHECK
 FATS204  TAPE1  280  123456                                    16 FT

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Bank's execs back micro graphics

NEW YORK — At U.S. Trust Co. of New York, the chairman of the board, members of the executive committee and other managers often create their own presentation graphics on microcomputers.

In fact, microcomputer graphics has become popular enough to raise a problem at the company occasionally, according to Peter Korndorfer, computer sciences vice-president.

"There are certain times during the month, and especially at the end of the quarter, when this tends to become a bottleneck because we really have only one plotting facility," he said. Employees, each with 40 plots to make, line up three deep, and the plotter runs all day, he added.

U.S. Trust uses Graphic Communications, Inc.'s Graphwriter running on IBM Personal Computers, and Korndorfer said the package's flexibility and ease of use are well balanced.

"You have maximum control within the constraints of two dozen prewired ways of representing numbers graphically," he noted. Early Graphwriter versions ran slowly, but performance has been improved, Korndorfer said.

Korndorfer began looking at micro graphics packages several years ago in an effort to reduce costs and speed turnaround for presentation graphics. At that time, employees were using both SAS Institute, Inc.'s SAS Graph and Lotus Development Corp.'s 1-2-3 to generate graphics, as they continue to do, but those packages were designed for analytical tasks rather than presentations, he said.

Mainframe presentation graphics represented another option.

"Our mainframe vendor was not happy when I proposed to use Graphwriter and [Hewlett-Packard Co.] plotters to do all our presentation graphics," Korndorfer said. "He asked, 'What do you do with all the good data on the mainframe?' and there is some validity in that, obviously." But that objection is diminishing as better mainframe-micro links emerge, he said.

"The deciding factor was that it was not easy to hook up the plotter to the mainframe," he said. Additionally, the batch-oriented mainframe approach would introduce delays, Korndorfer added.

Korndorfer is looking at specialized output devices that offer two main advantages over plotters: speed and the ability to produce color backgrounds.

Some devices can produce 2,000- by 2,000-line resolution, and at that level, circles look round and one cannot tell that the slide was generated by computer, he said. Others can generate output with up to 4,000- by 4,000-line resolution, "but for the purpose of presentation graphics, that's overkill."

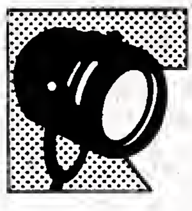
— **Eric Bender**

User cites immediacy of micro graphics

NEW YORK — When it comes to producing presentation graphics, Bob Ford and Helen Griffin disagree. The two Manufacturers Hanover Trust Co. managers make their line, bar and pie charts on, respectively, a departmental personal computer and a terminal linked to a corporate mainframe.

Ford, a personal computer graphics user and manager of business development and analysis for the bank's Financial Services Group, said he likes being able to see results immediately when he outputs a graph from his department's IBM Personal Computer-based graphics workstation onto its attendant Hewlett-Packard Co. HP 7475A plotter. "I can walk over there and see the output, do it my way and get the results," he said.

Griffin, the bank's graphics consultant and trainer, said Manufacturers Hanover's companywide graphics system, accessible on over 4,000 terminals in use at Manufacturers Hanover worldwide, makes it cost-effective for many users to share the centralized graphics output of the banking company's two Nicolet Zeta Corp. 810 drum plotters. Also in use are two Tektronix, Inc. 4692 ink-jet printers attached to a Tektronix 4510 rasterizer (which Griffin said is used to enhance output quality) and a commercial-quality slide-making system.



Users may not be able to see their output immediately, Griffin said, but when they do, the output is often of equal or better quality than that of a personal computer plotter.

The Nicolet plotters produce an average of 2,000 graphs and charts per month, a level of demand so great, Griffin said, that passwords have been issued to restrict

See **CHARTS** page 9

PRESENTATION GRAPHICS SOFTWARE PROGRAMS FOR THE IBM PERSONAL COMPUTER

Company	Package	Features	Random-Access Memory Requirement (in bytes)	Output Supported	Price
Decision Resources Westport, Conn.	*Chart-Master*	Bar, pie, line, area and scatter charts; data entered and stored independent of chart type	192K	Over 13 printers, 33 plotters, Polaroid Corp. Palette	$375
	Sign-Master	Word charts, including title pages, headlines, tables, financial summaries and forms	192K	Same as Chart-Master	$245
Digital Research, Inc. Monterey, Calif.	*DR Draw*	Creates charts and diagrams with picture elements including lines, text, marker characters, areas, pie segments, filled rectangles, filled polygons and circles.	256K	Many printers, plotters	$295
	DR Graph	Generates line, bar, bar/line, step, stick, scatter, pie and text-only charts.	256K	Same as DR Draw	$295
Graphic Communications, Inc. Waltham, Mass.	*Graphwriter*	Produces bar, line, combination, text/word, pie and specialized format charts; batch processing	128K	Variety of printers, plotters; Polaroid Palette, Matrix Instruments, Inc. PCR/QVP film recorder	$395 for Basic Set; $395 for Extension Set; $595 for both
IBM **Entry Systems Division** Boca Raton, Fla.	*PC Storyboard*	Creates screen-display presentations supporting many special effects	256K (PC-DOS 2.0 or 2.1); 320K (PC-DOS 3.0)	RGB composite and standard TV monitors; large-screen projectors; videocassette recorders; printers	$250
International Microcomputer Software, Inc. San Rafael, Calif.	*PC Paintbrush*	Free-form drawing; enhancements of graphs, text and images from other packages; choice of text fonts	192K (PC-DOS 2.0 and up)	Over 24 printers; Hewlett-Packard Co. 7475A, 7470A plotters	$139
Microsoft Corp. Bellevue, Wash.	*Chart*	Eight chart types in 45 formats; modifications displayed on screen; automatic scaling, spacing, centering	128K	Many printers, plotters	$250
Software Publishing Corp. Mountain View, Calif.	*PFS:Graph*	Creates bar, stacked bar, line, mixed bar/line, pie and area charts; combines up to four graphs on a single set of axes	128K	Wide variety of printers, plotters	$140

A sampling of the dozens of specialized graphics software programs available for the IBM Personal Computer. Many of these packages also run on other microcomputers under Microsoft Corp.'s MS-DOS operating system.

PRESENTATION GRAPHICS OUTPUT DEVICES — HARD COPY

Company	Product	Features	Price
Epson America, Inc. Torrance, Calif.	*JX-80 printer*	Prints in up to seven colors at speeds to 160 char./sec; 128 fonts; accepts special fonts downloaded to printer memory; dot-addressable graphics with 1:1 vertical-horizontal ratio	$800
	HI-80 plotter	Plots in four of 10 available colors; draws at up to 9 in./sec on paper and acetate	$599
IBM **Entry Systems Division** Boca Raton, Fla.	*IBM Personal Computer Graphics Printer*	Four modes of all-points-addressable graphics; bidirectional printing up to 80 char./sec	$449
	IBM Personal Computer Color Printer	Up to eight color ribbons; all-points-addressable graphics and text production; bidirectional printing of 35 to 200 char./sec	$1,995
Hewlett Packard Co. Palo Alto, Calif.	*Model 7475A plotter*	Six-pen graphics plotter with resolution to 0.001 in. and speed to 15 in./sec; accepts 11- by 17-in. paper or overheads	$1,895
	Thinkjet	Thermal ink-jet printer with removable cartridge; prints up to 150 char./sec.	$495
	Laserjet	Prints up to eight page/min with 300- by 300-dot resolution; horizontal or vertical printing	$3,495
QMS, Inc. Mobile, Ala.	*Lasergraphix 800 Model I*	Prints up to eight page/min; bit-maps 8½- by 11-in. and 8½- by 14-in. pages; automatic pie and bar chart generation	$9,995

PRESENTATION GRAPHICS OUTPUT DEVICES — OTHER MEDIA

Company	Product	Features	Price
Autographix, Inc. Chicago, Ill.	*Autographix 200*	Workstation produces high-resolution 35mm slides, color overhead transparencies, color prints, hard copy, video presentations; optional Matrix Instruments, Inc. QCR film recorder produces extremely high-resolution slides	$35,500 for Autographix 200; $32,000 for optional film recorder
General Parametrics Corp. Berkeley, Calif.	*Videoshow Business Presentation System*	Produces graphics images for display on color TV, color monitor or video projection; graphics displays with up to 1,000 colors in any picture and 0.0005 horizontal positioning accuracy	$3,499 for Videoshow; $595 for Pictureit software
Polaroid Corp. Cambridge, Mass.	*Palette Computer Image Recorder*	Produces color 35mm slides with 72-color palette, within minutes, on desktop	$1,799

Top, a small cross-section of the hundreds of printers and plotters that may be used with the IBM Personal Computer. Bottom, three specialized graphics output devices, chosen to illustrate the range of options available in microcomputer-based presentation graphics. The Autographix, Inc. Autographix 200 is a complete turnkey system based on an IBM Personal Computer XT.

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GRAPHICS from page 1

design; therefore, increases in ease of use are critical, emphasized William Higgs, graphics products manager at Digital Research, Inc. located in Monterey, Calif.

The percentage of business microcomputer users generating graphics will rise from 14% in 1984 to 21% this year, according to market research firm International Data Corp. (IDC), which is located in Framingham, Mass.

An IDC study last year estimated that slightly more than a million users will create graphics on personal computers this year and predicted that the total number of users will rise to almost 11 million in 1989.

Specialized packages to increase

The number of users employing specialized graphics packages are expected to climb from 561,000 to more than seven million within that time period, according to Deborah Kelly, manager of computer graphics research at IDC.

Many users first saw microcomputer graphics in Lotus Development Corp.'s 1-2-3 integrated package. The next step was to move beyond 1-2-3's relatively simple analytical graphs into more complicated, customized presentation graphics with higher quality output.

Presentation graphics functions can be divided into several categories: graphing charts, word charts and free-form (including paint and draw packages). Many, but not all, packages concentrate on one of these functions.

Range of chart types available

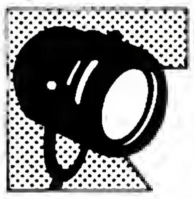
Graphing packages offer a range of predefined chart types and typically add some ability to glamorize them by picking among colors, labels and other enhancements.

Word chart software is aimed at producing simple messages in an attractive format — a relatively straightforward but important task, according to David Obershaw, graphics software product manager at Hewlett-Packard Co. in Santa Clara, Calif.

While talk about presentation graphics immediately brings data-driven graphing charts to mind, most presentations are actually oriented more toward text and drawings, Obershaw said.

Free-form packages can generate organization charts, corporate logos and many other complex graphics. Also, they can sometimes pull in prepared images from program libraries.

Paint and draw packages appear superficially similar but differ drastically in software architecture, Graphic Communications' Tarrant said. Paint software is pixel-oriented, while draw programs are object-oriented. This translates into differences in working methods and in output; for example, plotters typically provide vector output and cannot easily accommodate paint packages, he noted.



Both types of programs generally work best with a mouse, graphics tablet or other input device rather than the keyboard, and so far they have seen only limited use in corporations.

Need for 'free-form' infrequent

"Casual users don't take the time to create anything very complicated" with free-form packages, IDC's Kelly said.

"The need for a [free-form] package is short-term and doesn't occur very often," said Rich Reed, manager of personal computer administration at Cigna Corp. in Bloomfield, Conn.

Presentation graphics software also can generate report graphics. Color output is not nearly as important for reports, which tend to be reproduced in black and white, analysts pointed out.

With all these features to choose from, graphics users often work with several packages, each with different advantages.

For example, Glenn Fund, manager of end-user computing at GCA Corp. in Bedford, Mass., uses Chart-Master and Sign-Master from Decision Resources, Inc. of Westport, Conn., along with Digital Research, Inc.'s DR Graph. Among their strengths, Chart-Master is particularly easy to use, Sign-Master is good at setting up neatly formatted tables and DR Graph can set up multiple graphs on the same page, according to Fund. "They're all good," he said.

Picking through the flurry of features available in one package or another, some prove more useful than others. One often-promoted feature, the ability to import data from other programs, is not particularly important, according to Kelly.

Relatively few users take advantage of the feature, Digital Research's Higgs agreed, because excess data can clutter a presentation. "With more than 30 data points, you're designing a bad graph," he said.

CHARTS from page 8

the access of Manufacturers Hanover's 400 known graphics users.

Griffin said that users of Manufacturers Hanover's terminal-based graphics gain access to what she called high-powered software — Issco, Inc.'s Telegraph package — which runs on two Digital Equipment Corp. Decsystem-20 mainframes. The mainframes, she added, have the processing power to support Telegraph's ease-of-use interface, Cue Chart, from which users can select the appropriate graphics presentation format for their data. Ford, meanwhile, said he creates an average of 20 charts per week in his department's micro-based graphics work area.

— Ed Warner

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Flourishing add-on mart keeps pace with micro graphics

As friendlier and more powerful graphics software becomes available, increasing numbers of micros are being equipped with graphics or color cards and monitors, and inexpensive but capable output devices are making their debuts.

A flourishing add-on industry supplies cards and monitors that boost the graphics capabilities of IBM Personal Computers. IBM is also moving in that direction, the best recent example of this being the Enhanced Graphics Adapter and Enhanced Color Display announced last summer. With an optional memory card, the new Big Blue hardware offers 16-color graphics in 640- by 350-pixel high-resolution mode.

However, "it doesn't matter how fine graphics looks on [the] screen if you can't get it from the screen to the presentation media," said William Higgs, graphics products manager at Digital Research, Inc.

The most common microcomputer output device, the dot matrix printer, generally provides graphics output suitable for reports and presentations that do not require a high degree of polish.

For higher resolution, the next step is a pen plotter. Costs for some models have been driven below $1,000, according to Deborah Kelly, manager of computer graphics research at International Data Corp. (IDC) in Framingham, Mass.

In the case of laser printers, the price drops have been even more dramatic, with some price tags now dipping below $4,000. The new desktop model systems have dazzled a great many users.

"All strike-on technology is now obsolete," said Ron Goldfarb, office automation manager at Pratt & Whitney Co. in East Hartford, Conn. Laser printers "do it better at less cost in deathly silence," he said, and the ability to mix graphics with text on the same page is another bonus.

Further down the road, low-end ink-jet printers will also play a larger role in presentations, others said.

These hard-copy devices produce on paper and often directly on overhead transparencies. For more formal presentations to larger groups, the next step up is 35mm slides.

The cheapest method of generating slides from microcomputer graphics is simply to take a picture of the screen, either with jury-rigged equipment or with a commercial system such as Eastman Kodak Co.'s CRT Slide Imager, which costs $379 excluding development equipment. Some users find the results satisfactory.

However, this technique has two main drawbacks. The quality is limited by screen resolution, and colors may look odd because the eye reacts differently to glowing dots on the screen than it does to ink on a page.

Film recorder

Another approach is an inexpensive film recorder. The most popular of these is Polaroid Corp.'s Palette Computer Image Recorder, a desktop system which retails for $1,799, including processing equipment but excluding software.

Palette has sparked considerable industry debate on whether the system's resolution is high enough for standard business use. The hardware handles up to 920 by 700 pixels, but software typically is limited to the 640- by 400-pixel high-resolution mode for the standard IBM color monitor. This is significantly below the resolution offered by commercial slide-making houses, observers pointed out.

However, Palette-style equipment produces slides at a fraction of the usual commercial cost, and it may be the only answer for many price-conscious users, IDC's Kelly said. And, again, users may have no qualms about the quality. "Your notion of what's high quality will differ from mine," said David Tarrant, vice-president for applications products at Graphic Communications, Inc. "Graphics departments typically have imposed higher demands than those of the users."

Turnkey systems

At the high end of the slide-making spectrum, turnkey systems based on Personal Computer XTs or ATs generate professional-quality slides but may carry price tags rising above $70,000. While these systems also find a role in many organizations, they are designed for visual specialists rather than typical micro users.

Another option is on-screen displays, running either on computer monitors, television sets or video projection systems. Presentations running on standard monitors are best suited to very small audiences.

Finally, there are specialized presentation systems such as Videoshow from General Parametrics Corp. in Berkeley, Calif. With associated software running on a Personal Computer, the Videoshow hardware creates presentation diskettes that can store sequences of very high resolution pictures with up to 1,000 colors. The portable Videoshow unit then is hooked up to a monitor or other video display equipment for presentations. Users may also create slides through an optional Videoshow system based on the Palette.

— Eric Bender

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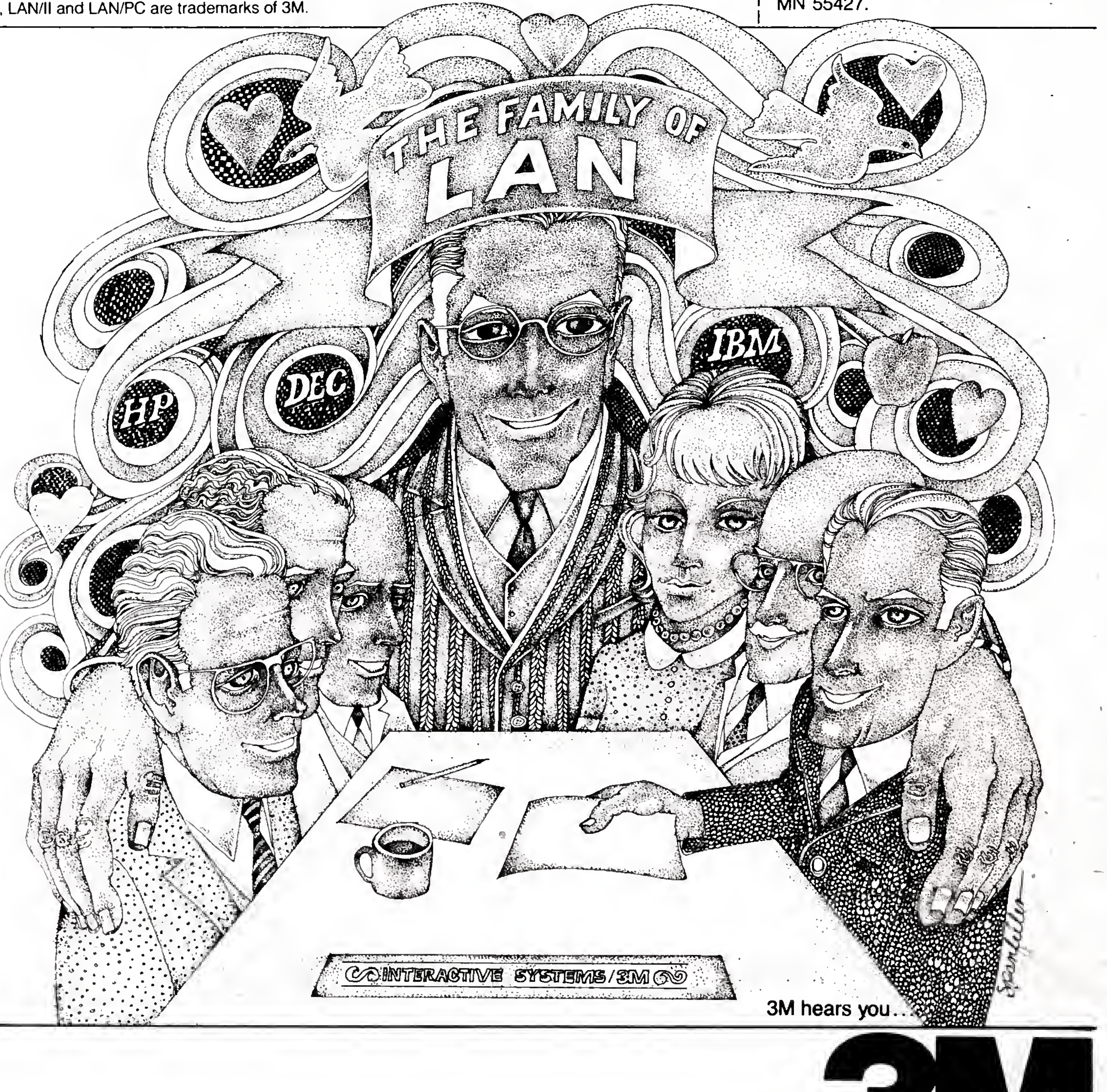

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NEWS

Users firm on requirements for future micro software

CW AT SOFTCON

By John Gallant
CW Staff

ATLANTA — "I am not sure anyone knows what the next big [microcomputer] software packages will be," Buddy Ray said. "I am not certain there will be another major breakthrough product like [Software Arts, Inc.'s] Visicalc. Maybe we have already covered all the bases."

Ray, manager of technical products for Atlanta-based Comsell, Inc., was typical of the attendees interviewed by *Computerworld* at last week's 1985 Softcon conference here.

While many attendees were uncomfortable predicting what the next generation of micro software will look like, they had little trouble deciding what they want to see next.

'The loud scream is for access'

A pressing issue, according to Loyd Towers Jr., a computer systems analyst with the U.S. Army Logistics Center in Petersburg, Va., is the introduction of generic, easy-to-use micro-to-mainframe links. "In my organization, the loud scream is for access to mainframe data. We need something much easier and more broad-based than the proprietary systems available today. I know a generic link that lets you get at all types of data is a tall order, but it should not be impossible."

Towers was not alone in his desire to see more facile, open links. Jack Stimler, associate senior scientist at the Phillip Morris Co. Research Center in Richmond, Va., said his company is concerned with the linking of all types of processors.

"We are looking at the integration of micros, mainframes and minicomputers," Stimler said. "We would like to be able to store information on the mainframe and download it as necessary to the other machines for manipulation. We need to see better links that provide the ability to link any kind of micro to larger processors from all manufacturers. I think the ease of use will come over time, and we will even see laptop access to the mainframe."

"I would like to see better integrated packages," said Arnold Shostak, a partner with Richter & Associates, a Montreal-based management consulting firm. "Today, the components of those packages cannot do what individual packages can — they are just not as good. Also, once local-area networks get off the ground, we will need to see more sophisticated business applications for the micro."

In addition, Shostak said, the coming months will see the end of what he labeled "useless" micro packages. "I am talking about those desktop organizers," he said. "It is fun to put your telephone list and your diary up on screen, but it is really not worthwhile. We can also get rid of the packages that let you run four or five applications at once. All you do is slow each of them down to a quarter of their speed."

Towers also said he would like to see more sophisticated integrated packages in the future. "I think the integrated products have to get better in each of the areas they cover. Right now, most of them are only good in the area the company is familiar with, such as the spreadsheet component. Also, the vendors will have to work on shrinking the memory requirements for the products. It would be nice to run an integrated package on a dual-floppy machine at home."

Comsell's Ray said artificial intelligence applications, such as expert systems, have the potential to be among the more important micro packages to come. "Maybe AI is the next big area for micros," he said, "but that still has a long way to go. That will grow slowly; we are only now beginning to see processors with the power to handle those kinds of applications."

Jerry Eggers, professor of engineering technology at East Tennessee State University in Johnson City, Tenn., said he is hoping to see micro-based tools for computer-integrated instruction. "I am very interested in that type of teaching — interactive instruction using micros and laser disks. It promises to be very useful for both training and general education. There are a number of companies working in that direction, but a lot of the advances are still on the technological horizon."

One of the most important future micro applications — in-house publishing systems — is already beginning to emerge, according to Don Schwartz, president of Londonderry, N.H.-based Don Schwartz Associates, a manufacturing representative firm. "I think that type of office publishing system has already arrived, to some extent. It will allow users to do typesetting, page layout, graphics input and to publish their own newsletters and other things."

But what else the future holds is anyone's guess, he said. "Everybody says someone will come up with the miracle package that will make the micro useful in the home. I do not know what that will be," Schwartz said. "And I do not think anyone does."

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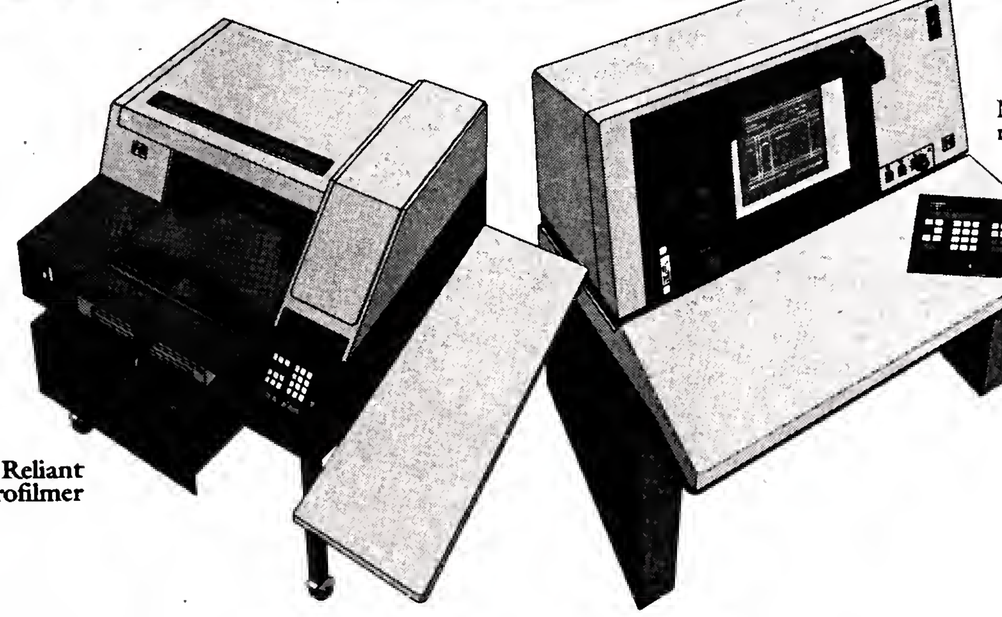

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Panelists divided on copyright protection schemes

CW AT SOFTCON

By John Gallant
CW Staff

ATLANTA — The nomenclature of modern-day piracy is laced with buzzwords and phrases like hardware keys, hidden program booby traps and worms, site licensing agreements and shrink-wrap licenses, bounty hunters and corporate policies and procedures.

Those are a sampling of the methods proposed to curtail the illegal copying of microcomputer software programs — methods that divided speakers at a recent panel session on software piracy held here at last week's 1985 Softcon conference. While there was debate over the feasibility of such software protection schemes, there was general agreement that the problem of copyright violation is bad and getting worse.

Ronnie Ward, executive vice-president of Richardson, Texas-based Future Computing, Inc., cited his firm's 1984 survey indicating that software vendors lost $600 million in revenue last year as a direct result of piracy. That figure, he said, is expected to grow to nearly $800 million by the end of 1985, compared with projected total market revenue for micro software vendors of $3.2 billion.

Ward said the Future Computing study showed that, on average, for each authorized copy of the 12 most popular micro packages in use today, there is one unauthorized copy also in use. "It is our belief that copying will become a greater problem, and most publishers will have to go to a copy protection scheme," he said.

Kenneth Wasch, executive director of the Software Publishers Association, which represents about 130 independent software vendors, countered one attendee's notion that piracy has actually helped micro software vendors by giving users an opportunity to evaluate packages before purchasing them.

"The product life cycles of two of the most successful [micro] packages, which happen to be games, have been dramatically shortened. Copies of these programs are available in every school through easily accessible channels. In fact, one of the companies is really lamenting the weak copy protection they used with the program."

Ronald Palenski, associate general counsel with the Association of Data Processing Service Organizations, Inc. (Adapso) said Adapso's antipiracy efforts are geared to fostering the belief that there exists a "social contract" between users and vendors of micro software that should not be broken by pirates. Adapso has embraced a four-pronged attack on piracy that includes efforts in education, in public relations, in the legislative arena in the courtroom — including a recently launched suit against American Brands, Inc. and Wilson Jones Co. [CW, March 11] — and in the technological realm with such proposals as the hardware key protection method, under which a hardware lock and key would need to be inserted in the micro's serial port for the software package to run.

"We [Adapso] are aiming at the development of a set of standards that can be used to build software protection methods," Palenski said. "That process is open to all. We are not engaged in product development. Our approach mirrors the theory of social contract. The standards will address both the effective protection of the vendor's product and the user's ease-of-use of that product."

Asked whether the various copy protection schemes imply that vendors do not trust corporations to police their users through internal antipiracy policies, Palenksi said, "Our goal is to persuade companies to adopt piracy policies, and we have gotten a large number of requests for help in doing just that."

Site licensing

On the issue of site licensing of micro software, E. Ric Giardina, general counsel for Micropro International Corp., said only a handful of users have expressed real interest in the concept. "Many companies look into the idea of site licensing, but they often balk at the idea of standardizing on one piece of software," he said. "Site licensing will work, but it will not cut out piracy. You cannot provide a site license for everyone."

Giardina said the rapid pace of technology has proven to be a real problem for software vendors struggling to protect their assets from piracy. "As soon as we were faced with the problem of multiuser licenses, we saw we had to face the issue of networking. This is an evolving process. We are doing everything we can, but we still have to do more."

When asked whether software vendors may employ "bounty hunters" in the future to sniff out those engaged in illegal copying, Wasch replied firmly, "No."

"Many people have volunteered to turn in pirates. It is not our intention to hire bounty hunters but to monitor what is happening in the user community and to choose appropriate cases for action. You do not want to look like you are at war with your customers."

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Micro-mini-CPU links seen as future in integration

CW AT SOFTCON

By John Gallant
CW Staff

ATLANTA — Microcomputer-to-mainframe links are but a passing fancy — the future belongs to the micro-minicomputer-mainframe link.

That was the message of several speakers during a session on micro-mainframe links at last week's 1985 Softcon conference here.

According to Larry DeBoever, president of Linkware Corp., a link vendor, micro-mainframe technology is only a temporary phase paving the way for integrated micros, minis and mainframes.

"In the next three to five years," DeBoever said, "large organizations will acquire micro-mini-mainframe link technology. The result will be corporate personal computers attached to local-area networks, not mainframes. Superminis will act as local-area network file servers using corporate data extracts from the mainframe. The major minicomputer players, Wang Laboratories [Inc.], Digital [Equipment Corp.] and Data General [Corp.], are already positioning themselves to fill that need."

DeBoever cautioned prospective link buyers to use micro-mainframe communications products to solve current tactical problems and also to consider carefully what role the selected link will play in the very different networked environment of tomorrow. That is, planners must adopt a strategic plan for the future integration of processors.

"There are tactical and strategic solutions," he said. "Most people settle for the former because they cannot find the products that will allow them to leverage new technologies."

Fellow panelist William Shattuck, a software analyst for San Francisco-based Montgomery Securities, said, "I think the idea that micro-mainfame links are a passing technology is correct. But how will we evolve into this world of local-area networks and minicomputers?"

"It is my belief," DeBoever said, "that a few new companies will emerge to fill the need for data communications networks. I think the whole concept will break loose when IBM legitimizes the idea of local-area networks. When IBM ships its first local-area network, everyone will shift to that technology. But IBM's Achilles' heel is its lack of a substantive mini. That is why the mini vendors are really going after that market."

Panelist Gerald Cohen, president of Information Builders, Inc., agreed that the mini will play a vital role in the future integration of processors. "The mini is an ideal staging device," he said. "You can download host data to departmental machines linked to a number of personal computers. That is an up-and-coming application for the mini."

Similar software for both sides

Cohen said software vendors addressing the micro-mainframe — even micro-mini-mainframe — communications market should aim at providing similar software on both ends of the link. "Providing the same software on both sides of the link is important," he said, "because once a user learns the product, he will be able to use it across all levels of hardware."

DeBoever said users must tread carefully in selecting from the among the current micro-mainframe links. He said a company's link strategy must be considered in the context of its current and future communications technology and its applications and data base strategies.

"You cannot look at links in a vacuum," he said. "Anybody can write a file transfer product, but the true integration of personal computers and hosts is the real problem. That is akin to cross-domain processing, which is still far off in the future."

AIIM annual meet set for April

WASHINGTON, D.C. — The Association for Information and Image Management (AIIM) will host its annual conference and exposition for managers, directors, analysts and planners from April 29-May 2 at the Washington Convention Center here.

The 1985 AIIM Show will feature seminars on emerging technologies, engineering, micrographics and generalist information as well as a variety of general interest events.

Field trips to the Library of Congress optical digital data disk program and the Navy military personnel records system have also been planned.

Registration fees for the conference and exposition range from $160 for a half day to $530 for four full days, plus an additional $20 charge for on-site registration.

More information is available from AIIM, Department of Conference and Exposition, 1100 Wayne Ave., Silver Spring, Md. 20910.

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Decentralized MIS key to managing corporate micros

CW AT COMPUTER FAIRE

By Kathleen Sullivan
CW West Coast Bureau

SAN FRANCISCO — Imagine for a moment that the traditional data processing department is represented by a well, whose vast water reserves are overseen by a well manager — the MIS director. To tap the well's resources, users bring their buckets to the well manager.

This time-honored way of drawing water is challenged, however, when someone discovers that a powerful river flows nearby.

Unlike the well, the river — microcomputer technology — is available to everyone. No longer do users have to take their buckets to the well; soon, many are going directly to the river, entirely bypassing the well manager.

According to Robert N. Watkins, who presented the well analogy to an audience at last week's West Coast Computer Faire, MIS directors should welcome the discovery of the river.

Watkins, an instructor at Learning Sciences Corp., a Santee, Calif.-based consulting firm, told his audience that the goal of MIS managers should be to "decentralize computer competence" and "create an environment where users can succeed."

The MIS manager can accomplish these tasks by encouraging the use of all the organization's resources, from microcomputers to mainframes, he said.

Manager should advise users

Drawing on his well analogy, Watkins said, "We have to create a situation where the well manager can advise users on when the water is safe to drink and which container is the most appropriate one to use.

"We have to let them know when they should go to the river and when they should come to the well," he continued. "We should give users canteens and teach them that they don't always need someone to lower the bucket for them."

MIS managers do not have to turn users into programmers to accomplish this goal, Watkins said. Instead, they can provide the tools that will "create stronger users" and lessen their dependence on the MIS staff. Fourth-generation query languages represent one such tool, he explained.

The data processing staff must also learn how to develop a good working relationship with end users, Watkins said. In the past, organizations relied primarily on technocrats who developed programs and tools for users. But with the growing number of personal computer users, new skills are required.

Empathy for user concerns

Watkins said the MIS staff needs to develop empathy for user concerns, which differ from the technical staff's interests. Users, for instance, will view program development differently from programmers.

"They might not care how elegant our code is, but then again, they don't see it," Watkins said. "What they care about is getting a job done without a lot of trauma."

Marla Quandt, who oversees the use of personal computers at Siliconix Inc., a Santa Clara, Calif., semiconductor firm, also spoke at the seminar.

She said her company has standardized on IBM. The firm has purchased 50 IBM Personal Computers, including IBM Personal Computer XTs and ATs. Instead of buying equipment from a variety of vendors, Siliconix decided to sign a contract with Businessland, which provides the systems and peripherals.

The agreement has a definite advantage when it comes to troubleshooting and maintenance, she said. "If we had bought equipment from different vendors and something happened, everyone would be pointing their fingers at everyone else," she said.

Siliconix relies on an independent training firm to teach its employees how to use various software packages, Quandt said, and the arrangement has worked out well. Many employees see the chance to leave the plant for training as a bonus, she said. And outside training is a more effective tool than in-house training, Quandt said.

Outside training better

"It's difficult to find time in a workday to give an individual tutorial," she explained. "And it's better to send employees outside the plant for training, so that all their attention can be focused on learning during that period of time."

Siliconix plans to sign a contract with a third-party maintenance company, Quandt said.

"This little chore of troubleshooting is endless," Quandt said, adding that she spends 40% to 60% of her time trying to solve hardware and software problems. She said when a system goes down, she typically spends about two hours trying to handle the problem. Quandt estimated that the firm would spend approximately $25,000 for a one-year agreement.

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U.S. negotiators win accord on transborder data flow

Policy wording caused wrangle

By Bryan Wilkins
CW Washington Bureau

WASHINGTON, D.C. — After a more than two-year struggle, U.S. negotiators have reached a preliminary agreement with European countries on a written statement on transborder data flow. Ministers of the Organization for Economic Cooperation and Development (OECD) are expected to endorse the statement of general intent formally this week.

The development is a major achievement for the U.S., which has faced resistance from France on producing a statement of general intent on the transborder data flow issue. In recent years the issue has been a thorny one for U.S. multinational corporations that transport large volumes of data across national boundaries with the aid of computers, data processing and telecommunications.

> ”
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> *The development is a major achievement for the U.S., which has faced resistance from France on producing a statement of general intent on the transborder data flow issue.*

The 24 member countries of the OECD, representing the developed economies of the free world, argued about the wording of the transborder data flow policy declaration since its drafting by the U.S. two years ago. A final form of the statement was agreed upon by the executive committee of the OECD two weeks ago and will be presented to OECD ministers for approval this week.

"We are very pleased at the progress we have made so far. It is a useful development and augurs well that the ministerial level will go along," commented Anne Hollock, director of the Office of Trade in the Bureau of Economic and Business Affairs at the U.S. Department of State.

The policy statement noted that "computerized data and information now circulate, by and large, freely on an international basis," and that privacy protections have been adopted for the data in most countries. In addition, the statement said, "Investments and trade require a climate of transparency and stability in policies and regulations" governing transborder data flow.

During the past two years, the French delegation pushed strenuously for the inclusion of language targeting the different types of intracorporate data flow and wanted the OECD to embark on a comprehensive study to measure the quantity and type of such data flow. This effort was strongly opposed by the U.S., Canada, Britain and several European countries.

The policy declaration states that it is the intent of the 24 OECD member countries to "promote access to data and information and related services, avoid the creation of unjustified barriers to the international exchange of data and information [and] seek transparency in regulations and policies relating to information, computer and communications servies affecting [transborder data flow]."

The policy declaration, if adopted by the OECD ministers, sets out a further agenda to focus on other transborder data flow issues. Hollock said reaching agreement on this statement may help the foreign ministers decide to take up another U.S. concern, namely, getting the OECD to include trade in services at the next plenary meeting of the General Agreement on Tariffs and Trade conference.

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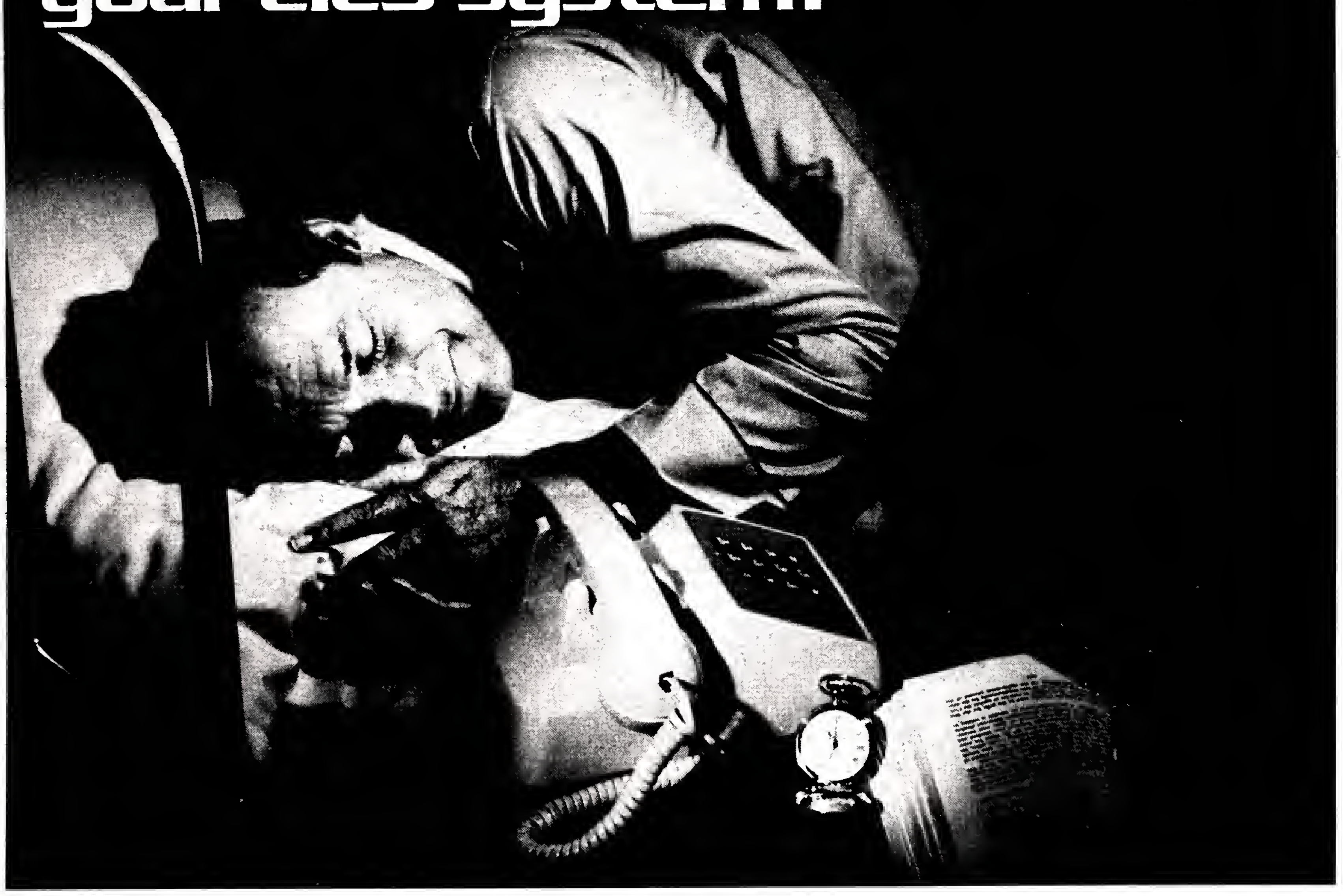

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WASHINGTON UPDATE
Mitch Betts
CW Washington Correspondent

Three major airlines drop biased CRS displays

WASHINGTON, D.C. — Under government pressure, three major airlines have agreed to eliminate from their computer reservation systems (CRS), a feature that provided travel agents with computer displays biased toward each airline's own flight schedule, according to the U.S. Department of Transportation.

United Airlines, Inc., American Airlines, Inc. and Trans World Airways, Inc. voluntarily agreed to eliminate the biased displays from their CRS after discussions with Transportation Department officials.

The move came shortly after key members of Congress and the Justice Department discussed the possibility of forcing divestiture of the reservation systems [CW, April 1].

The now-defunct Civil Aeronautics Board prohibited bias in primary CRS displays, but the major airlines had added a feature that permitted travel agents automatically to lock in a secondary display that deliberately favored the CRS vendor.

At a recent U.S. Senate hearing, officials from small airlines said the divestiture is needed because the CRS systems operated by United and American give the dominant carriers a monopoly power.

United and American officials disagreed, saying their investments in hardware and software have improved service for consumers.

Computer industry ruled exempt from contract act

WASHINGTON, D.C. — The U.S. Court of Appeals here recently upheld the U.S. Department of Labor's 1983 decision to exempt computer service vendors from the Service Contract Act, which establishes a minimum wage for service contracts with the U.S. government.

The court decision resolved a longstanding dispute between the computer industry and labor unions over the applicability of the act to computer service contracts with the government. The law was intended to prevent "wage busting," where an employer cuts wages to become the lowest bidder for contracts.

The AFL-CIO and seven other unions sought to overturn the exemption, arguing that some computer service technicians are underpaid and that the Labor Department improperly granted the exemption.

The Computer and Business Equipment Manufacturers Association and the Computer & Communications Industry Association supported the exemption on the grounds that a wage floor would disrupt the industry's merit pay practices, which base pay on performance and experience.

The court agreed that the industry is not conducive to wage busting and said that former Secretary of Labor Raymond J. Donovan had properly exercised his statutory authority to grant the exemption.

Cbema opposes Reagan's proposed ICST budget cut

WASHINGTON, D.C.— The Computer and Business Equipment Manufacturers Association (Cbema) recently announced its opposition to the Reagan administration's proposed 50% budget cut for the Institute for Computer Sciences and Technology (ICST).

At a budget hearing held by the U.S. Senate Subcommittee on Science, Technology and Space, Cbema President Vico E. Henriques said ICST's program to develop computer network interfaces and techniques for testing protocol performance should not be eliminated.

The Reagan administration proposed a fiscal 1986 budget of $5 million, half the previous budget of $10 million, and said the standards development programs should be turned over to the private sector. The ICST is a unit of the National Bureau of Standards.

Henriques said the standards' work improves the competitiveness of U.S. business in world trade, and he disputed the idea that the ICST standards program could be transferred to the private sector.

"It would take any private sector organization . . . several years to reach the level of development and expertise that ICST currently has. If and when that level were reached, we seriously doubt that the neutrality and nonproprietary aspects of the ICST programs would remain," Henriques testified.

The Institute of Electrical and Electronics Engineers, Inc. also testified against the ICST budget cut at a separate Senate hearing.

Metalworkers to profit from automated tool growth

WASHINGTON, D.C.— The increased use of automated machine tools in the U.S. metalworking industry, spurred by the National Bureau of Standards' (NBS) research on automated manufacturing, will save the industry up to $250 million to $760 million a year by 1990, according to a recent report.

The report, prepared by the Management Collaborative Group of Chapel Hill, N.C., said the NBS Automated Manufacturing Research Facility "appears to be playing a key role in laying the groundwork for incremental implementation of computer-integrated automated manufacturing."

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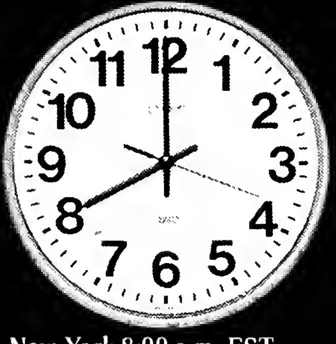
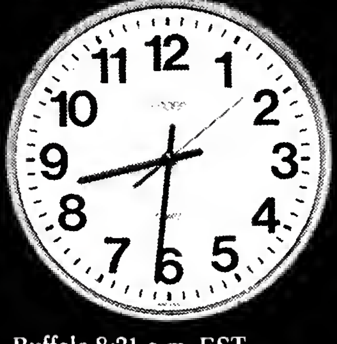
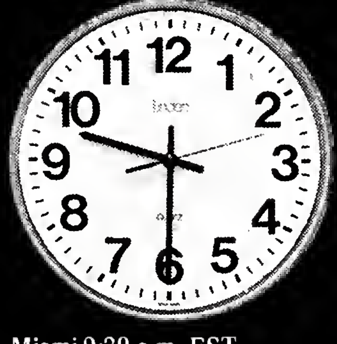
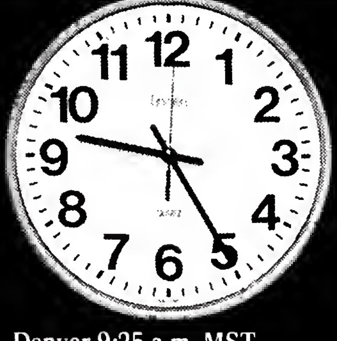

New York 8:00 a.m. EST
Start Data Transmission


Buffalo 8:31 a.m. EST
Data Transmission received


Miami 9:30 a.m. EST
Data Transmission received

Atlanta 10:06 a.m. EST
Data Transmission received

Houston 9:20 a.m. CST
Data Transmission received


Denver 9:25 a.m. MST
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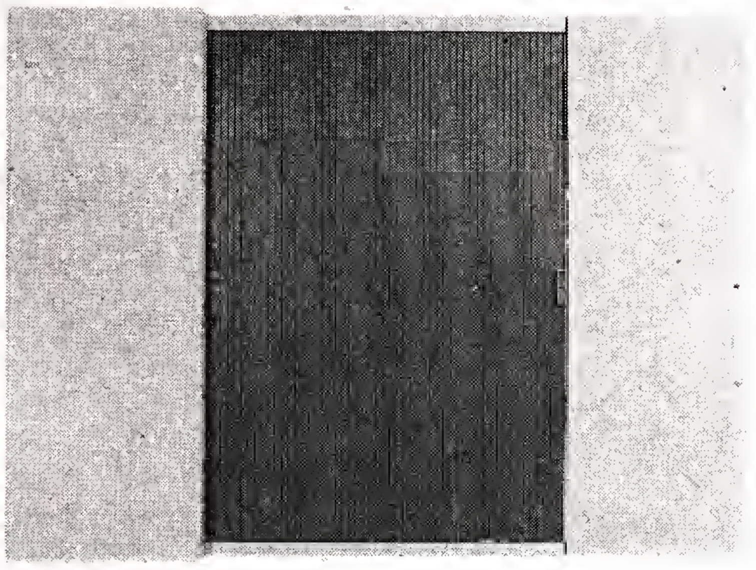

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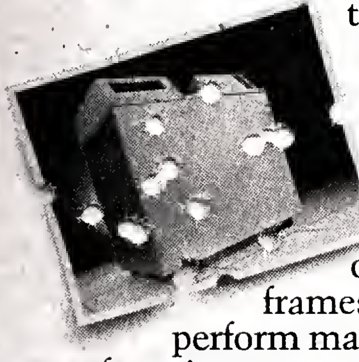

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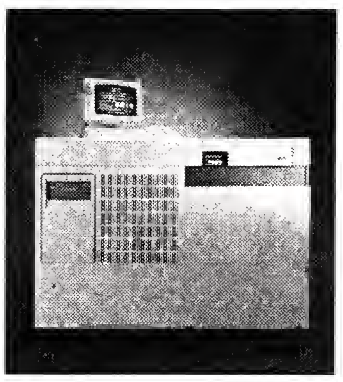

You see, the System 36 was designed to depend on its central processing unit (CPU) for many different applications, such as word processing. This results in slower response time to the end-user. And because the System 36 lacks an advanced data base of its own, you have to rely on your host for sophisticated data base management functions.

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32-bit Architecture	Yes	No
Cache	Yes	No
Object Code Compatibility	VS 15, 25, 45, 65, 85, 100, 300	36 only
Virtual Memory Operating System	Yes	No
Removable Storage Options	Yes	No
Local Area Networks	Yes	No
Architectured for OA/DP	Yes	No
Relational Data Base	Yes	No
Industry de facto Standard Word Processing	Yes	No

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EFT industry needs assertive stand with telecom firms

By Kathleen Sullivan
CW West Coast Bureau

SAN FRANCISCO — In a deregulated telecommunications environment, companies in the electronic funds transfer (EFT) industry can no longer afford to take a laissez-faire attitude toward telecommunications issues. Instead, they must adopt an assertive stance in order to minimize risks and maximize benefits in dealings with telecommunications carriers.

That was the message Michael Senkowski delivered to a seminar audience at the annual convention and exposition of the Electronic Funds Transfer Association, held here last week.

Companies that want to reduce their telecommunications costs must "learn how to bargain with telephone companies," said Senkowski, a partner in the Washington, D.C., law firm of Wylie & Rein. He noted that negotiating with telecommunications firms can dramatically reduce costs.

Bargaining reaps benefits

As an example of the benefits of negotiating, he cited ABC's nine-month bargaining effort for communications services for the 1984 Olympic Games. Because ABC was willing to bargain for a contract, the network paid only one-third of what it would have paid without negotiations, he said.

"It's important to recognize that you have choices and alternatives in telecommunications service," Senkowski explained. "That gives you leverage in negotiating the terms of a contract with telephone companies."

He noted that an understanding of the current telecommunications regulations and policies is also critical. If a company does not have the resources to follow the regulatory proceedings, it should hire a consultant who can keep it informed on telecommunications issues, he said.

Agreement on issues

Ron Osterberg, a partner in the Antietam Group, a Summit, N.J.-based firm specializing in EFT research and consulting, agreed with Senkowski on the importance of telecommunications issues.

"Stop treating telecommunications like a stepchild and start treating it like a discipline," he urged the audience.

Deregulation has produced unpredictable costs, Osterberg said. To help keep costs in line and to counter the tendency toward instability, he recommended that companies take an active role in tariff hearings.

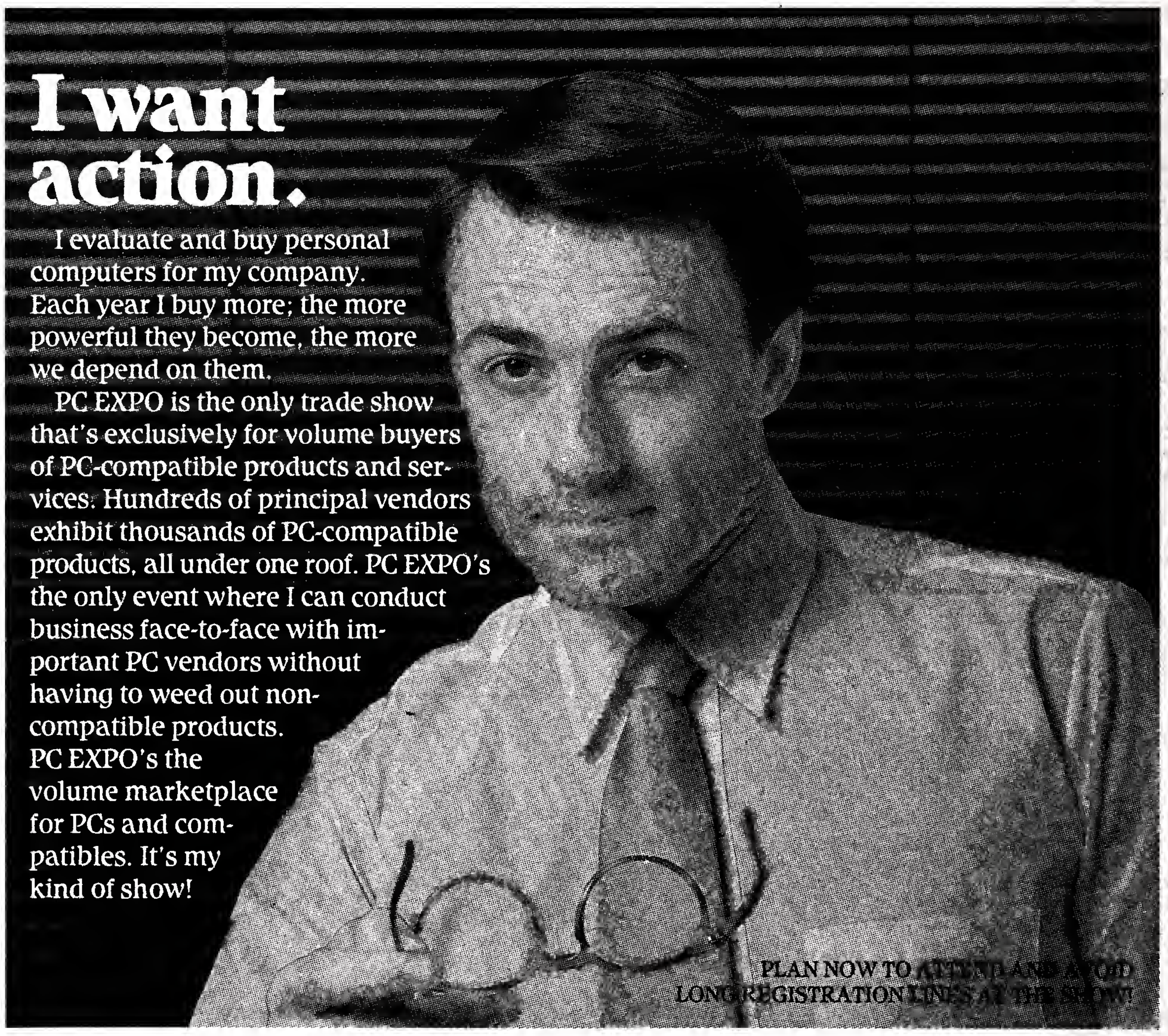
IEEE meet to emphasize graphics

SILVER SPRING, Md. — The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is sponsoring the 1985 Trends and Applications Conference at the Sheraton Inn-Northwest Washington here May 20-22.

The conference theme is the use of computer graphics for greater productivity. The keynote speaker will be Andries van Dam, chairman of the Department of Computer Science at Brown University, Providence, R.I. He is coauthor of the book *Fundamentals of Interactive Computer Graphics* and has been an editor of several publications on computer graphics.

Tutorials on May 20 will be offered on business graphics and graphics standards. On May 21 and May 22, the conference topics will include computer-aided design and manufacturing, animation, business graphics, presentation graphics and data base-to-graphics interfaces.

Registration fees range from $90 for the conference alone to $470 for the tutorials and conference. More information is available from Trends and Applications '85, P.O. Box 639, Silver Spring, Md. 20901.



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GG ☐ DP/WP manager/operator
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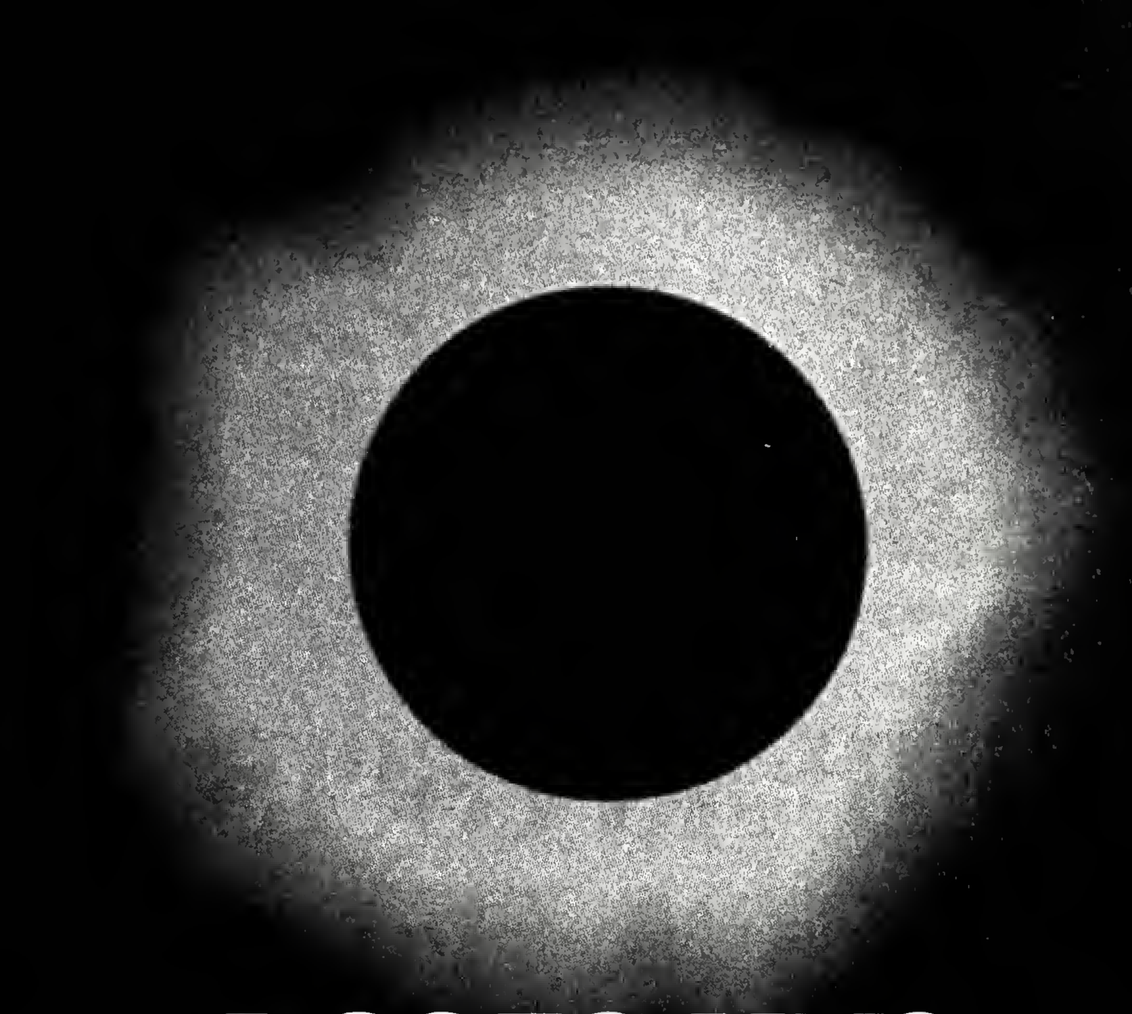

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Study finds work area can impact programmer's ability

By Jeffry Beeler
CW West Coast Bureau

NEWPORT BEACH, Calif. — A programmer's physical work environment apparently influences software productivity far more profoundly than MIS managers had previously suspected, according to Atlantic Systems Guild, Inc. (ASG) principal Tom DeMarco.

Speaking recently at an ASG-sponsored Structured Development Forum, DeMarco for the first time disclosed the results of a programming benchmark test that challenges accepted notions about why some programmers excel while others consistently lag.

Programming productivity has long been known to vary dramatically from individual to individual. Between the best programmers and the worst lies a productivity differential of some 25-fold, DeMarco said.

In the past, wide variations in coding output have been attributed primarily to factors like individual differences in ability, he said. But after examining the results of its programming benchmark test, ASG began to consider alternative explanations.

The study suggests that programmer productivity hinges to a large degree on environmental considerations like desk size, noise levels and privacy, DeMarco said.

"We're not saying that the size of your desk makes you a better programmer," said DeMarco's fellow ASG principal, Tim Lister. "Obviously, programming productivity is affected by all sorts of factors. But what we do say is that the work environments of programmers vary widely from organization to organization and that there seems to be a strong correlation between performance and environment."

Change job environment

In companies where programmer work spaces are optimized, coding productivity can rise four- or even fivefold, DeMarco said.

"Changing the physical characteristics of a programmer's personal job environment is the most important thing a manager can do to improve software productivity," he added.

Underlying DeMarco's comments is his long-standing belief that MIS managers need a standard yardstick for gauging relative programmer performance. Because such rating systems have been virtually nonexistent, "most companies don't have even the foggiest notion of where they stand in the broad scale of coding productivity," he said. But in today's increasingly competitive business environment, MIS managers "can no longer afford to remain ignorant" about how their programmers measure up to the rest of the industry.

DeMarco's conclusion eventually led him and his New York-based consulting firm to devise a programming benchmark test that would allow applications developers to rank themselves against other members of their profession.

Nicknamed the "Coding War Games," the test was designed to show whether software productivity is significantly affected by the environment in which programmers work. In concept, the exercise is fairly simple: Once each year, programmers from different companies are given the same coding assignment, which they are asked to complete within one day.

Test administrators note how long each contestant took to code successfully the assigned application and then rank the competitors according to their finishing times.

In 1984, the exercise drew 166 programmers from 36 companies. Each participant was experienced in coding, was allowed to use any language and facilities and was paired with another volunteer from the same employer, DeMarco said.

When the exercise was

See **TEST** page 24

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Ample work space tops productivity recommendations

Many computer user organizations inadvertently retard their software output by forcing their programmers to work in cramped, noisy surroundings that make sustained concentration and high productivity virtually impossible, according to Atlantic Systems Guild, Inc. (ASG) principal Tom DeMarco.

"An effective work environment is the most important factor in determining programmer productivity," DeMarco said during a recent Structured Development Forum, sponsored by ASG in Newport Beach, Calif.

To optimize their software productivity, employers should allot each of their staff programmers a minimum of 100 square feet of dedicated floor space, including 30 square feet of tabletop, DeMarco said.

Quiet, private offices needed

If programmers are to perform at maximum efficiency, they also require a high degree of quiet, telephones that can be turned on and off at will and private offices with doors and ceiling-high walls.

Many corporations, however, skimp on such amenities and squeeze their programmers into tiny cubicles, where they are constantly beset with interruptions and chatter from neighboring coworkers, DeMarco said.

In the short term, the bare bones approach to work space design may enable corporations to minimize their overhead.

But in the long run, DeMarco warned, "cheating on floor space or physical environment is the most expensive economy of all," because it undercuts programmer productivity.

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TEST from page 22

over, ASG personnel compared the finishing times of all the programmers who had completed their assignments without any errors. At first, the test results looked fairly routine: Across the entire sample, productivity varied widely, just as DeMarco and his associates had expected. In fact, the fastest of the competitors finished their coding tasks roughly eight times more quickly than the slowest, he said.

But when the test administrators examined their findings in detail, they were struck by how little finishing times differed among members of the same team. On the average, the speediest members of the teams completed the coding assignment just 20% faster than their partners, Lister said.

"We didn't expect the test to produce this kind of result," DeMarco said. "It came as a complete surprise to us."

The investigators then questioned the competitors about their everyday work environments and reached some telling conclusions:

- In general, the most productive 25% of the contestants reported having nearly twice as much floor space as the least productive 25%.
- More than half of the fastest quarter described their work areas as acceptably quiet, compared with 29% for the slowest quarter.
- More than 60% of the top fourth of the finishers expressed satisfaction with the amount of privacy their work areas afford, whereas only 19% of the bottom fourth said they feel the same way.

"What the data suggests," DeMarco theorized, "is that there's something about a company, its working environment and corporate culture that affects a programmer's productivity either favorably or adversely. People in good organizations do well, while people in bad organizations do poorly."

Lister expressed a similar view. Although he stopped short of attributing the test results entirely to differences in physical work environments, he minimized the significance of other potential influences like inequalities in training or salaries.

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OA offers alternative path to DP career success

By Donna Raimondi
CW Staff

NEW YORK — Office automation — as a career track — can offer women experience in management, technology and employee relations, according to Nathely McElrath, user support manager of office information systems at First Boston Corp. here.

Many people equate office automation with word processing, electronic filing, telephone messaging and other office duties, but specializing in OA offers training in a myriad of functions, said McElrath, who spoke at an Association for Women in Computing seminar titled "DP Career Survival: The Trend Toward Specialization," at the New York University Club here recently.

Office automation is data processing, McElrath contended. OA functions include knowledge of personal computers, telecommunications and DP applications, she said. Programming knowledge is vital for some jobs in OA, McElrath said, because even if 95% of the users are happy with what is available to them, there are always the 5% who need customized reports or information that is not easily available. For women with a DP background, the opportunities are many and varied, she said.

Titles and functions for OA have not been clearly delineated yet, in contrast to data processing, which has a clear progression from junior programmer to programmer, and then to junior analyst, senior analyst, up to project leader and on to manager, she said.

Office automation positions continue to grow, McElrath said, because OA saves time in the corporation, and time is money. "I like OA because I can take the results of what DP does on its big IBM mainframes and put [them] on my Wang system, and my end users love it," she said.

In addition to the traditional aspects of OA, managing an OA environment includes tasks like negotiating with vendors for discounts and valid information, McElrath said. Other facets of the job include equipment selection, purchasing and assembly, she said, as well as inventory record keeping. An OA manager must keep current on issues like ergonomics, telecommunications, user training and software evaluation as well, she added.

Local-area networks are being installed for OA use, so "If you don't know telecommunications, learn it," she advised.

There are several paths of progress in OA, McElrath said. Word processers can move to supervisory and training positions within an OA department, she said. Another career path is from central computer operations to hot line service to personal computer support, she added. A data processing professional can move from anywhere in the OA structure to a top management position, she said.

Keep current with technology

"You don't have to know how to program a personal computer," she said, but the more technical knowledge acquired, the better the chance for advancement. New OA equipment hits the market all the time, she said, so keeping up with current technology is very important.

McElrath is closely watching developments in image readers, for instance, so that when she decides they are practical to use, she can incorporate them into her organization, she said. "Users are reading about the new technology and asking us for the latest stuff — unlike before, when we had to push things on them," McElrath said.

The ultimate goal of OA is to clear everyone's desk of everything, McElrath said. The OA system will replace calendars, pens and pencils and telephones with one do-everything terminal, she said.

ICA conference planned for May

DALLAS — The president of Rolm Corp., Kenneth Oshman, will be the keynote speaker at the International Communications Association's 38th annual conference and exposition, Telecom '85, here May 5-10.

Also to speak at the conference is futurist Alvin Toffler, author of *The Third Wave.* Toffler will reportedly discuss his new book, *The Adaptive Corporation,* which examines AT&T and lays out his strategy for corporate survival in the information age.

Several technical programs reportedly will take place covering such topics as the status of European networks, cellular radio systems and voice mail, among others.

Registration for the conference is $450 for those from ICA member companies and $550 for those from nonmember companies. A spouse's program is priced at $125. Retired members and their spouses are admitted free.

Vendors and consultants providing telecommunications services may not attend, the ICA said.

The ICA is located at Suite 828, 12750 Merit Drive, LB-89, Dallas, Texas 75251.

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Communications offers channels to job opportunities

By Donna Raimondi
CW Staff

NEW YORK — "Communications!" As the family friend offered "plastics" to Benjamin Braddock in the movie *The Graduate* so Susan Jarrett offers communications to women in the 1980s.

The communications field — incorporating voice, data, video and radio — offers women many job opportunities, and the best way to break into communications is through voice communications channels, said Jarrett, assistant vice-president of telecommunications at Bankers Trust Co. here. Jarrett and Constance Schack, an officer in telecommunications at Pershing, a clearinghouse on Wall Street, jointly addressed the Association for Women in Computing (AWC) seminar titled "DP Career Survival: The Trend Toward Specialization" at the New York University Club recently.

There are four basic career paths in voice communications: user management, technical support, vendor business and consultation, Jarrett said. Each path offers opportunities for women with backgrounds ranging from liberal arts degrees to highly technical degrees, she said.

For user management positions, "You have to be an expert in telecommunications, and if you are not, you have to know which vendor or consultant to go to," Jarrett said.

Responsibilities involve some traffic engineering, bill verification and cost control, systems operations and maintenance, she said. Understanding the hardware and software that enhances voice systems is necessary, as is user training, Jarrett continued.

Other functions of a voice communications user manager are circuit assurance and transmission testing, dealing with problems arising from circuit and transmission problems, keeping up the telephone directory and keeping the telephone operators up to date on the systems capabilities, Schack said.

Technical support makes all the rest happen, Jarrett said. Jobs in this category involve repairs, general maintenance and helping with transmission testing [circuit assurance], she said. Most large companies have their own technical support staff, but vendors also offer such positions, she said.

Vendors offer a plethora of jobs for people whatever their level of technical expertise, Schack said. Equipment vendors and transmission vendors need people to manufacture or distribute, sell, service and maintain communications systems.

'A niche on the vendor side'

"You can find a niche on the vendor side," Jarrett said, depending upon the level of technical expertise. Consulting, however, usually requires five to 10 years in the industry, she said.

But even in consulting — evaluating, selecting and implementing new products, establishing networks, doing long-term feasibility studies — there are jobs gathering data that require two years or less of communications experience, she said.

"There are loads of opportunities," Jarrett said. Voice communications is lagging behind the data processing industry by about 15 years, she said.

As companies discover that their phone bills are growing and voice technologies are changing rapidly, the voice communications field becomes more important to them, she said.

Women should join professional telecommunications organizations, take courses and read appropriate publications in order to upgrade their skills and keep current, Jarrett said.

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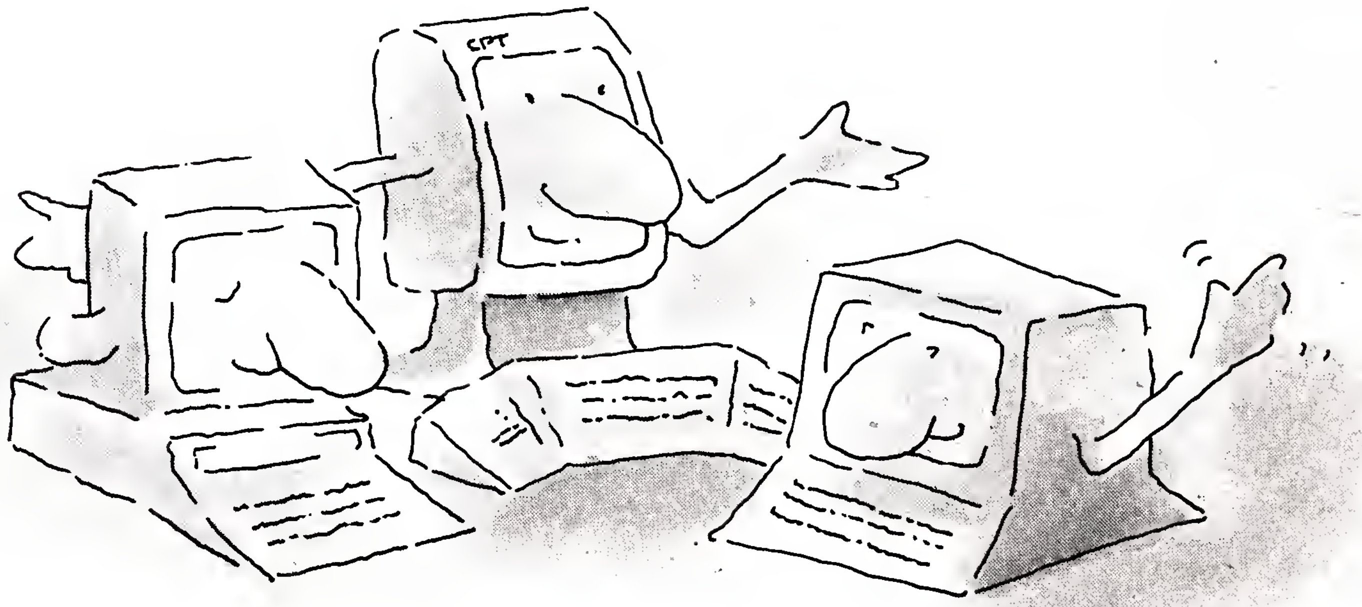

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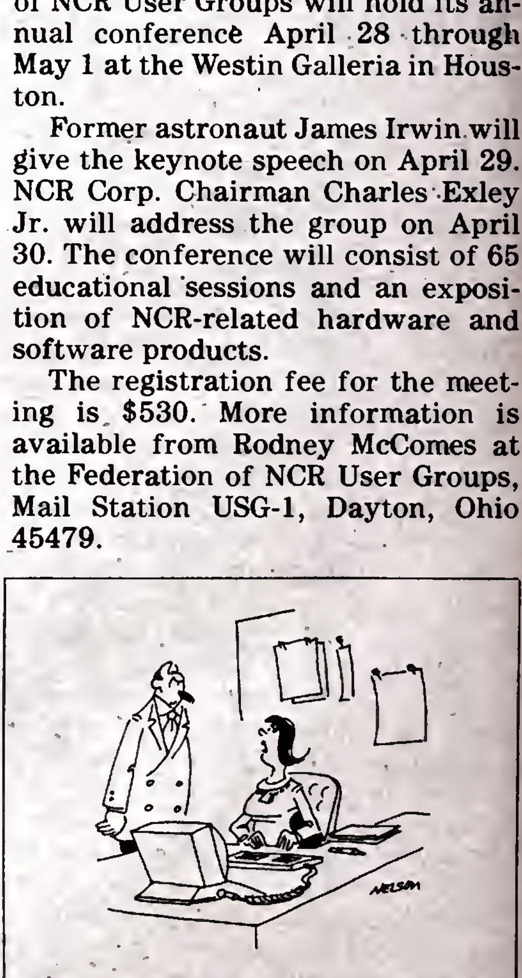
NCR users meet set for April 28

DAYTON, Ohio — The Federation of NCR User Groups will hold its annual conference April 28 through May 1 at the Westin Galleria in Houston.

Former astronaut James Irwin will give the keynote speech on April 29. NCR Corp. Chairman Charles Exley Jr. will address the group on April 30. The conference will consist of 65 educational sessions and an exposition of NCR-related hardware and software products.

The registration fee for the meeting is $530. More information is available from Rodney McComes at the Federation of NCR User Groups, Mail Station USG-1, Dayton, Ohio 45479.



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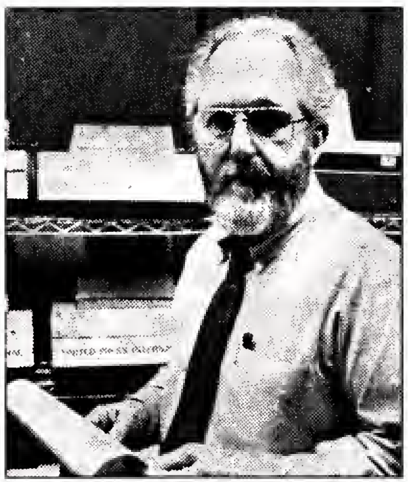
Systems bring quiet to chaotic network newsrooms

By Donna Raimondi
CW Staff

NEW YORK — Radio and television network news directors are switching off noisy wire service machines and the confusion that accompanied them in favor of quiet, electronic newsrooms. Two of the national television and radio networks have installed electronic systems to handle the material coming into their newsrooms from their own and outside sources.

The volume of news received by NBC News from wire services such as the Associated Press, United Press International, Reuters and others was unmanageable to the point that there was the possibility of missing a story, according to John J. McCormick Jr., director of systems development for the radio, news, sports and enterprises divisions of NBC.



CW photo by D. Raimondi

Hoffman

Wire services have increased the number of stories they transmit from about 350 to 1,200 a day over the last decade, he said. At the same time, the average length of the stories has increased by about 50% and transmission speed has gone from 5 char./sec to 120 char./sec, he said.

Information that came into the newsroom clattered onto news wire machines in several layers of hard copy, which were torn off by copy people and distributed to news writers, McCormick said. The writers then edited the stories into scripts on their typewriters, he said. A major story could hit and not be distributed to the proper news writer because of the delivery time delay, he said.

Wire stories at NBC News now are fed directly into a Basys, Inc. electronic newsroom system and onto the terminals of writers and editors, McCormick said. The stories are coded into categories — sports, weather, news bulletins, business — and fed into an all-topics file, he said. Script writers have immediate access to all stories, and word processing capabilities with which to write and edit the stories that apply to them, he said. Audible signals on the system alert the writers to news bulletins, he said.

NBC News contracted with Basys, a Mountain View, Calif.-based firm, for two separate systems — one for network radio news and one for network television news, McCormick said. In September 1983, NBC News installed a trial system with 27 terminals for the television network, he said.

In 1984, NBC News asked Basys for the largest system it could provide to help cover the Democratic Party's national convention in San Francisco and the Republican Party's national convention in Dallas. At the time of the conventions, about 600 NBC News people learned how to use the electronic newsroom system, he said.

The national conventions

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CNN scoops rivals with first electronic news system

By Donna Raimondi
CW Staff

The electronic newsroom system — new to NBC and CBS — has been in operation at the Cable News Network (CNN) of Turner Broadcasting Systems, Inc. since the network's inception five years ago.

There were no systems designed specifically for television news when CNN started, according to Robert Barnes, director of corporate information systems.

CNN encouraged and partially funded the development of the Basys, Inc. newsroom system in 1979 to have it ready by June 1, 1980, when CNN went on the air, Barnes said. Nobody had ever done 24-hour news network programming before, he said.

"We have one hour to put together a one-hour newscast," Barnes said. Without word processing, electronic news gathering and printing, the network could not do what it wanted to do, he said.

Every department and function in Atlanta, as well as each of CNN's eight bureaus in the U.S., has 9.6K-bit/sec on-line, real-time terminals, Barnes said, over AT&T's Digital Dataphone Service (DDS). The company decided on a digital service to avoid problems with hackers, he said.

Everyone in the organization can keep track of schedules, telephone numbers, satellite feed times, show rundown and booking, as well as wire service information, Barnes said. CNN sets up files for special events and automatically routes any news wire information with certain keywords into that file, he said.

The first space shuttle launch in 1980 gave CNN its first taste of the power of its system, Barnes said. "We were just a few months old and had just barely gone on the air when the space shuttle happened," he said.

File for shuttle stories

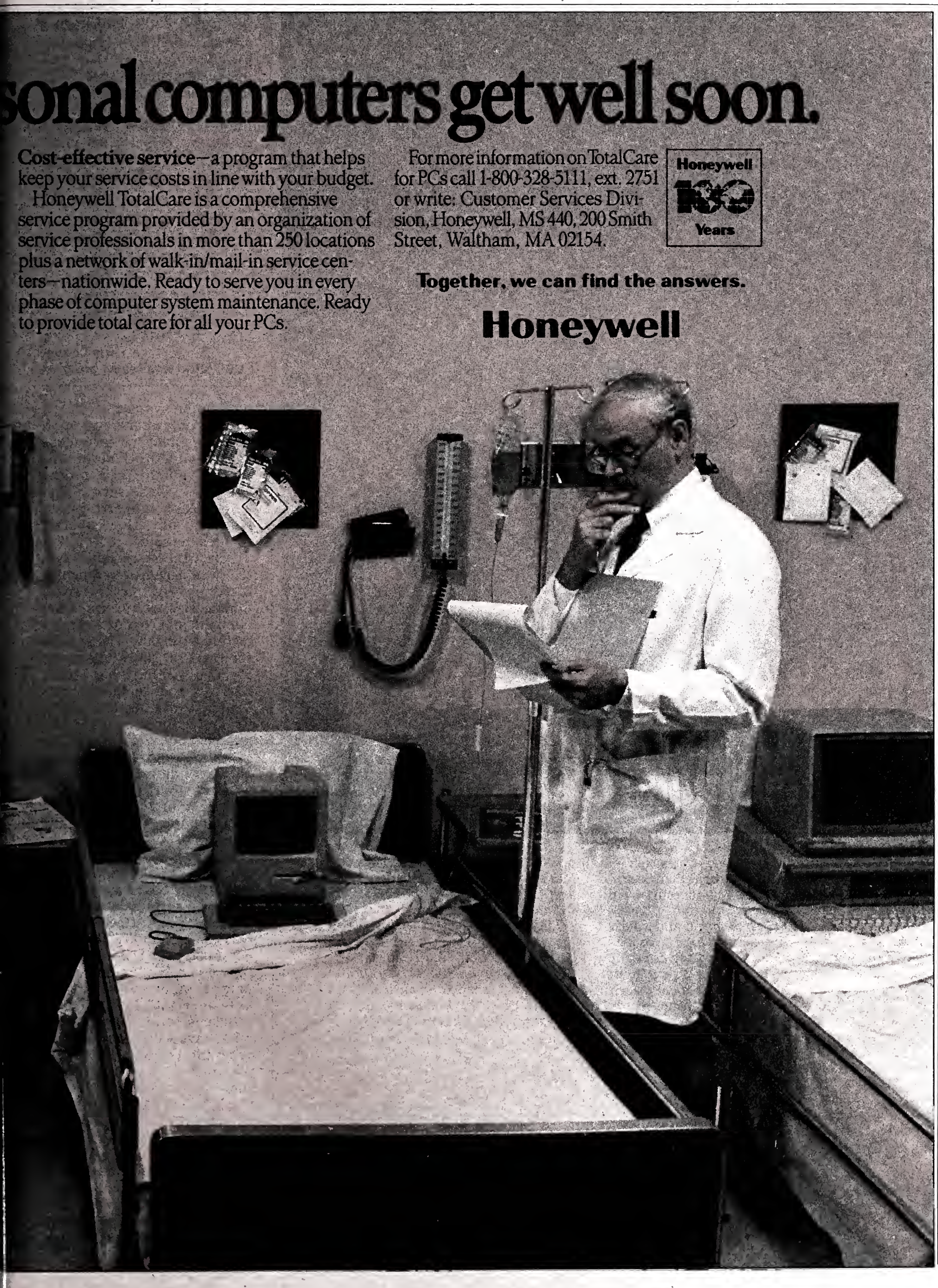
Barnes grabbed a terminal, a modem and a small printer and drove to the site of the launch; with one telephone, he dialed Atlanta and set up a file for space shuttle stories, he said. The computer automatically selected all wire stories about the shuttle and dumped them into the file, he said.

CNN's equipment at this point consists of three Onyx Systems, Inc. computers for CNN and two of them for Cable News Headline News Service.

The machines run under AT&T's Unix operating system, Barnes said. The company will more than double its capacity this year (from the present 120 to 300 ports) by replacing the Onyx machines with a fault-tolerant processing system that is currently in development, he said.

There are wire machines in the newsroom strictly as backup devices, Barnes said. "Any machine that runs 24 hours a day is going to break," he said, and CNN cannot afford to miss any important news.

"I wish this program would work!"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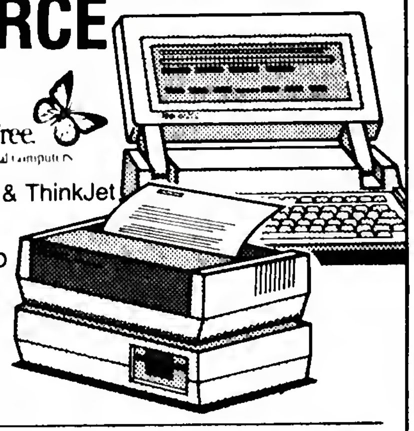

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NEWS

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also helped convince CBS, Inc. News of the value of electronic newsrooms, said Larry Cooper, director of news for CBS News Radioradio program. CBS News brought its Newstar system, from Colorgraphics Systems, Inc. of Madison, Wis., to the conventions in San Francisco and Dallas last year, he said.

CBS News staff wrote the convention news scripts for radio news in those cities and engineers inserted the sound back in New York, he said. "This saved us considerable money because we didn't have to move out a lot of tape-editing facilities, engineers and personnel to handle that," Cooper said.

The Newstar radio system provides electronic mail, bulletin flashes, address files and word processing functions as well as the wire service, Cooper said. Writers, editors, assignment editors and staff members in the seven studios in the CBS News building have terminals from which they can access news stories, edit them and send them on for the next step in the process, he said.

A total of 20 terminals are in place now, and the addition of eight more will allow the radio news feature operation to come on-line soon, he said. The television arm of CBS News will install the system in the next few weeks, he added.

NBC News' Basys system is composed of two Onyx Systems, Inc. CPUs running under AT&T's Unix operating system with Onyx communications controllers that link up to the writers' Qume Corp. terminals or Digital Equipment Corp. VT220s, according to Sheldon Hoffman, managing director of news production systems.

> *'There was a loud roar of disapproval from the people from whom we were taking terminals.'*
>
> **— Larry Cooper
> CBS News Radioradio program**

The processors run in a mirror system for redundancy, he said. NBC News will soon have four CPUs, probably DEC VAX series machines, each supporting one-quarter of the system devices, he said.

The CBS News radio system was designed and manufactured by Colorgraphic Communications Corp., Cooper said, at a cost of approximately $150,000. The system for the CBS News television division will have a lot more features, such as teleprompting and video machine startup, and will cost more than a million dollars. The CBS News radio system has a pair of hard disks with 340M bytes of storage, he said.

Instead of going to a backup computer, the main CPU consists of a series of microcomputers, with each board handling two devices, he said. If one board goes down, only two terminals or other devices are affected and boards can quickly be pulled out and sent to Colorgraphics for repair while spares are plugged in, he said.

Cooper said he had some problems training "people who have been working on typewriters for 100 years" who did not want to give up their typewriters. By election night, the users had changed their minds, he said. According to Cooper, when several of the terminals had to be moved to a television studio on election night, "there was a loud roar of disapproval from the people from whom we were taking terminals."

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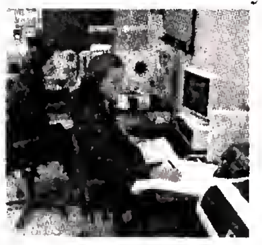

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By Amy MacDonald
Special to CW‡

CAMBRIDGE, England — The word Cambridge usually conjures up two images: cabbages, which are grown on the flat fenlands here, and King's College, whose lofty Gothic steeples epitomize Cambridge University. More recently, however, other images have been associated with Cambridge: the computer, and more surprisingly, the Porsches, swimming pools and other symbols of commercial success that are visible signs that this rural backwater is becoming the Silicon Valley of England.

In 1960 there were roughly 30 high-tech firms in this area; today there are about 350, with a yearly revenue of nearly $1 billion. More than 200 of them were established in the last five years. Companies are continuing to start up at the rate of two a month.

Although Cambridge-area firms include the two giants of the British computer industry — Acorn Computers and Sinclair Research, Ltd. — about 75% of the companies here are small (employing under 200 people), independent and homegrown. They include such respected names as Cambridge Interactive Systems, Shape Data, Laserscan, Logica, Cambridge Consultants and Cambridge Instruments. Most are research-and-development-oriented (volume production tends to be subcontracted out). One-third design either hardware or software for computers, with a special concentration of computer-aided design activity.

Cambridge University's real contribution has been as a spawning group for new companies. A family tree shows that virtually every new firm grew in some way from its hallowed halls. The university espouses the notion of commercial application of academic know-how and has fostered a strong relationship between the school and industry. In evidence of this stance, the university does not object if its professors simultaneously hold jobs as company directors.

Sir Clive Sinclair, of Sinclair Research, claims that this was not always the case. He recalled that when he first came to Cambridge, he was denied permission to read an important research paper in the university library because he wanted to see it for commercial purposes.

According to "The Cambridge Phenomenon," a report published by Segal Quince & Partners, some academicians are still worried that the phenomenon could go too far — as it has in the U.S. "The boundary between advice to industry and consultancy is very blurry. . . . We must be careful not to become a firm of consultants to industry," the report said.

At the same time, there has occurred a financial crunch at Cambridge University, which forced many academics out into the business world. Competition from industry has not yet created a serious university "brain drain" — in fact, if anything, administrators seem relieved. "The availability of jobs is a great boon," said John Bradford, Trinity bursar.

Little help from government

An estimated 20% of area firms have taken advantage of a government loan scheme to help new small businesses, and a similar number were aided by the government's Support for Innovation funding. But the majority survived by being self-funded or through term financing.

A Department of Trade and Industry spokesman estimated that the UK spent several million dollars last year on projects encouraging high-technology industry; it spent less than France, West Germany and Ireland. Much of that money went to entice firms to locate in areas like Scotland. Consequently, the

See **UK** page 36

MacDonald is a free-lance writer living in London.

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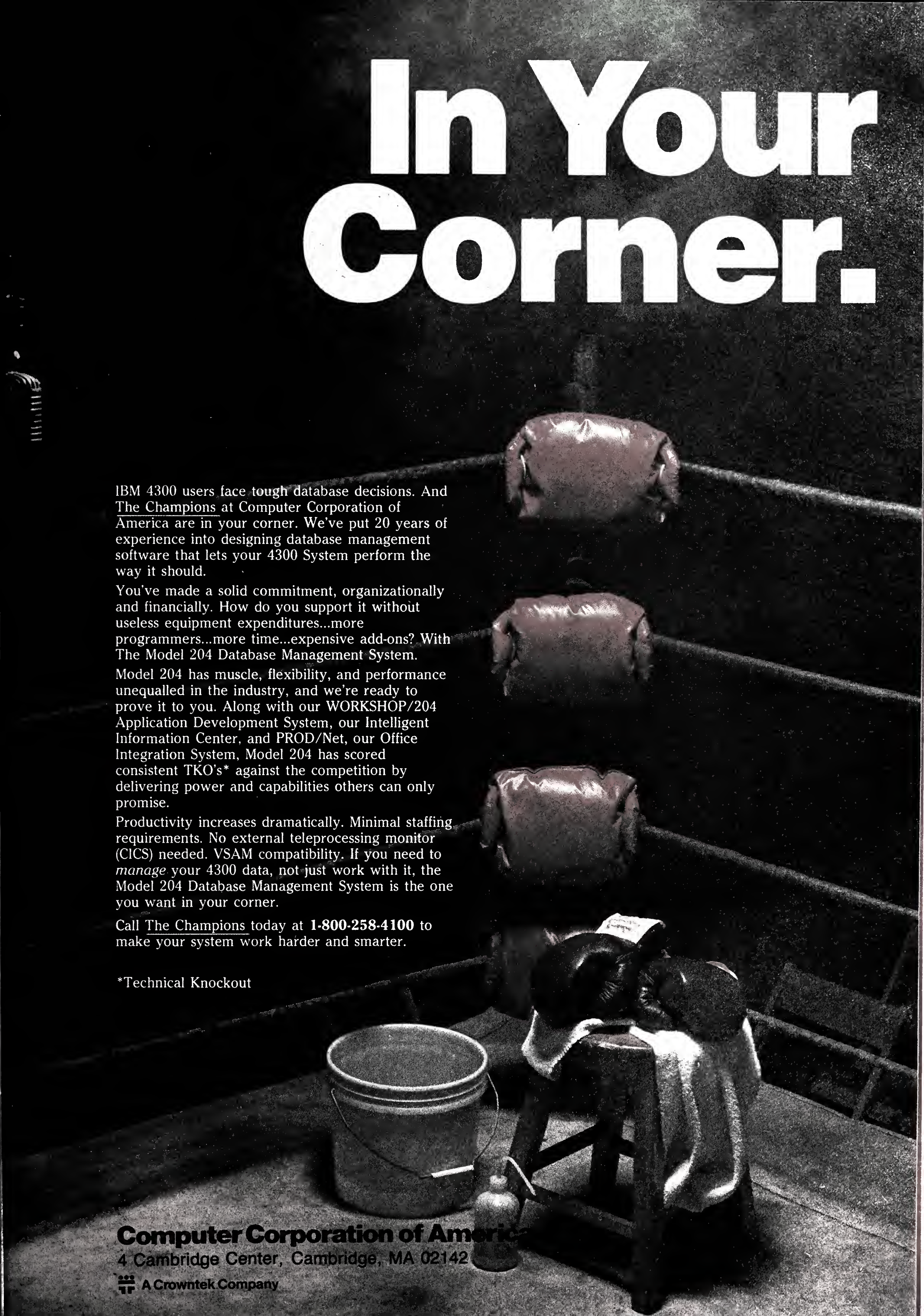

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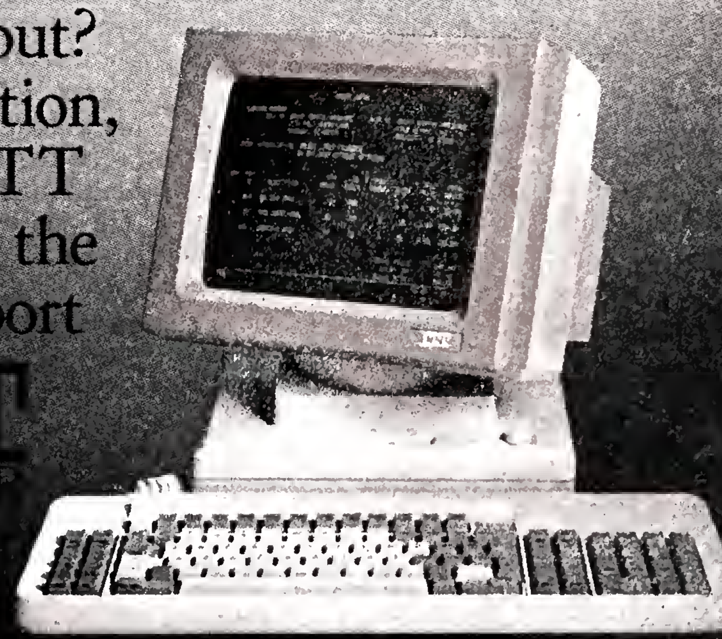

The new plug-compatible ITT 1778 is 24% smaller than their 3178.

INTERNATIONAL REPORT
CW International News Network

AUSTRALIA

SYDNEY — Five major American Express (Amex) outlets in the Asia-Pacific region will use only IBM equipment, because of a recent mandate by American Express International. Amex sites here, as well as in Hong Kong, Seoul, Singapore and Bangkok, have been ordered to convert existing systems to IBM.

■

CANBERRA — Equipment from Japan's Facom Ltd., valued at $1.8 million, will reportedly replace equipment destroyed by fire at the National Library here. The equipment will restore the library's on-line network services to 260 branches throughout Australia. The operations were halted in a fire last month.

■

MELBOURNE — Three academic institutions here received Pyramid Technologies, Inc. scientific processors to participate in national artificial intelligence projects funded by Australia's Department of Science. Melbourne University is planning to develop a new version of Prolog and a deductive data base, Monash University will experiment with algorithms for unification, and the New South Wales Institute of Technology is working on producing expert systems.

BRAZIL

BRASILIA — Contem, a local NCR Corp. subsidiary, may be the first to construct a front-end NCR Contem 3690 system in Brazil. The modular and transparent processor is said to function in the IBM Systems Network Architecture network environment. The company is awaiting approval of Brazil's Department of Informatics.

FRANCE

PARIS — Victor Technologies, Inc., after rising from the ashes of Chapter 11 under the U.S. Federal Bankruptcy Act, unveiled two additional microcomputers for its European audience here during the recent Spring Informatique show. The company, now owned by Swedish Datatronics, introduced the VPC, an IBM-compatible machine reportedly offering more power than IBM's Personal Computer XT for a 20% lower price tag. The company also debuted the VLI, an upgrade of the former model 9000 that is also IBM-compatible. Both systems are said to be available this month.

JAPAN

TOKYO — AT&T is working to crack Japan's value-added network and office automation markets. Agreements have already been struck with Japan ENS, Inc., Ricoh Co. and Olivetti-Japan.

According to AT&T International's Vice-President John Hinds, AT&T has shipped packet-switching equipment to Japan ENS, Inc. and will be distributing AT&T office systems through Ricoh and Olivetti-Japan.

■

TOKYO — Japan Storage Technology Corp. (STC) has redirected its product strategy here, in the wake of the American parent company filing for bankruptcy protection under Chapter 11 under

UK from page 32

firms in Scotland and in England's Thames River Valley region are largely outside imports and subsidiaries from other countries.

Imaginative financial and management support from the local branch of Barclays Bank has also played a critical role, one that in the U.S. would have been undertaken by venture capital, according to Nick Segal, author of "The Cambridge Phenomenon." From an early date, Barclays' manager undertook to finance many of the risky new companies and created a computer club where the heads of new companies could fraternize, air problems, exchange tips and make crucial business contacts.

So, while Britain does not pose a threat to the industry, Americans may have something to watch across the waters.

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the U.S. Federal Bankruptcy Act.

The Japanese company is selling the parent company's magnetic disks, integrated circuit disks and tape disks, along with products from other companies. Insiders here said the firm will probably test-market a series of computer-aided design and manufacturing products in Japan and then offer them for sale in the U.S.

NETHERLANDS

AMSTERDAM — MAI's European operations are reportedly being dismantled here as a result of cost-cutting procedures. Dutch vice-president of the firm Albert Snelling has resigned, and it is thought that only a few technical people will be retained here. National Advanced Systems, Inc. is also facing problems in Europe. In the wake of a recent corporate reorganization, senior officers and the general manager of the firm's Dutch operations have left the company.

■

AMSTERDAM — IBM is selling its Personal Computer to students here at very attractive prices, in direct competition with Olivetti Corp. and Commodore Business Machines, Inc. For approximately $1,260, students carrying college identification can get an IBM Personal Computer with 128K bytes of memory and two floppy disk drives.

■

THE HAGUE — Because of political reasons, the Dutch Postal, Telephone and Telegraph (PTT) authority will use several suppliers for its digital public telephone exchange currently under development. Sources reported that AT&T, Philips Information Systems, Inc. and Ericsson Information Systems will supply the PTT with communications systems through 1988, after which point ITT will enter the ranks with its system 1240.

SWEDEN

STOCKHOLM — Sore backs, strained eyes and other ergonomic-related complaints are just excuses to avoid technology, according to the Swedish Association of Graduate Engineering (Sage) here. Sage maintained in a recent statement that the main issue of computerization in Sweden is its resulting short-term unemployment. But without computerization, Sage insisted, Sweden will face long-term unemployment.

■

STOCKHOLM — Computer experience is considered more important than a university degree for starting computer career here, according to a leading Swedish industrialist. "We have noticed no correlation between good grades and work performance. It's more important to recruit from within the industry," according to Rolf Johansson, president of Atlas Copco Data. Johansson said the high demand for computer personnel here necessitates taking greater risks in the hiring process. But because nobody stays at these jobs for very long, he concluded, "It's easy to get rid of people who don't work out."

COMPUTERS INC.

"No, I don't speak computerese, nor do I speak technobabble!"

■

STOCKHOLM — Computerization has yet to result in any noticeable savings here, according to Swedish government officials who convened recently at a "Computer Day" held for all Swedish state departments. The state DP workers said they are now only in the planning stages of automation, and many structural changes can be anticipated. The seminar participants also said more education is needed to maximize the benefits of computerization.

WEST GERMANY

GUETERSLOH — The Berlin software house M.I.S. Ingenieurbuero Gmbh has been taken over by Bertelsmann-Gruppe, the media giant based here. The software house will be added to the newly formed Bertelsmann Software Gmbh. M.I.S., best known for its Rechentext word processing package that won the 1984 German Software Award for its integrated package called Papyrus. The firm's focus will be on software for personal and home computers.

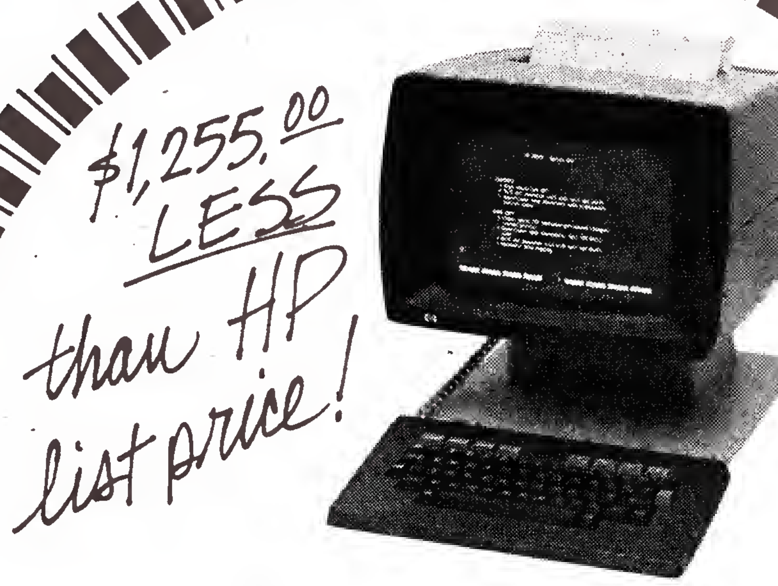
■

COLOGNE — The Business Institute for Automation here plans to demonstrate its videotex system in conjunction with four prominent partners at the upcoming Hannover Faire. Participating in the project will be BMW AG, an insurance company called Versicherungsgruppe, the grocery chain Rewe Zentral AG and the city government of Duesseldorf.

■

KARLSRUHE — An artificial intelligence research project was announced here by the University of Karlsruhe. The $3.5 million project is expected to encompass speech recognition and the use of computers in medical diagnosis.

The West German goverment has reportedly earmarked some $65 million over the next three years to develop expert systems.



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Calculation aid speeds company's tax computations

NATICK, Mass. — A computer systems vendor here had a taxing problem on its hands until it installed a software package to calculate sales and use taxes on its computer products and services.

When Prime Computer, Inc. bills its customers, its invoices must include any state, county or local taxes that are levied in areas where the customers are located. The firm processes more than 11,000 invoices each quarter, has sales that add up to more than $500 million a year and serves customers that are scattered throughout the U.S. and the world.

Until recently, finding the correct sales or use tax rate for each customer was a nightmare, according to John Griffen, a senior tax specialist for Prime. "We were using a manual system to add all those different rates to our invoices," he said.

Order entry employees from the firm's sales accounting division used tax manuals to compute the sales taxes Prime had to collect from its customers and forward to different regional governments. The employees checked invoices to determine where a client was located, then looked through the tax manuals to try to pick out the most up-to-date tax rate in that locality.

"But even at that, with all those invoices to process, we were lucky if we could pick up the correct amount of state taxes due, never mind the county and local taxes assessed in some jurisdictions," Griffen said.

'No problems'

In 1981, the firm automated its tax computations with software from AVP Systems. The Sales/Use Tax package, which runs on a 4M-byte Prime 750, computes the taxes due for different localities and integrates the information into Prime's billing and accounting system. "Now we have no problems computing the correct tax," Griffen said, "and we can do it automatically."

Error rates on invoice taxes have dropped from about 9% to about 3% since Prime began using the software, according to George Connor, Prime's supervisor of taxes. He said the firm has substantially increased its business since the days of manual tax accounting, so he cannot estimate the time savings the automated system represents.

When a customer orders products or services, employees in Prime's order entry department enter information about the order, including the customer's address and Zip code, into the system.

After checking Prime's customer files to make sure a customer is not exempt from taxes, the AVP software reads the customer's Zip code and uses it to determine appropriate taxes. The system then generates invoices that include the taxes.

Griffen said the tax information is kept up to date because each month AVP sends Prime coding sheets from which data entry workers input changes in tax rates. If a large area suddenly switches its tax rates between updates, the vendor sends Prime additional information at once, he said.

The updates prevent Prime from facing problems like one the firm encountered about five years ago, during a New York City tax change. Prime did not learn about the change until after it had processed about 40 invoices at the old rate, according to Connor. For each of those invoices, employees in the tax department had to figure the taxes a second time, a task that consumed most of one business day.

"Now we get those changes immediately," Griffen said, "and both the current rate and the prior rate of a tax are in our system, so we've always got the correct rate for the date of the sale."

Connor said the 3% error rate that remains in Prime's tax calculations emanates mainly from conversion programs Prime constructed to get AVP's software to run on its computers. The software had been written for IBM systems, and Prime's programmers did a quick, stopgap conversion to bring it up quickly on Prime's machines.

The firm is now comparing its conversion programs against those that AVP has since written for other customers who run Prime shops so that it can make the software more accurate, he said.

Expert systems symposium topic

WASHINGTON, D.C. — The use of expert systems in an emergency management program will be explored in a symposium here April 24-25 in the main auditorium of the Herbert C. Hoover Building at the U.S. Department of Commerce.

The symposium will bring together AI researchers and emergency management personnel, according to the cosponsors, the Federal Emergency Management Agency and the National Bureau of Standards.

Registration is free.

Additional information is available from Paul Bryant, Federal Emergency Management Agency, Washington, D.C. 20472.

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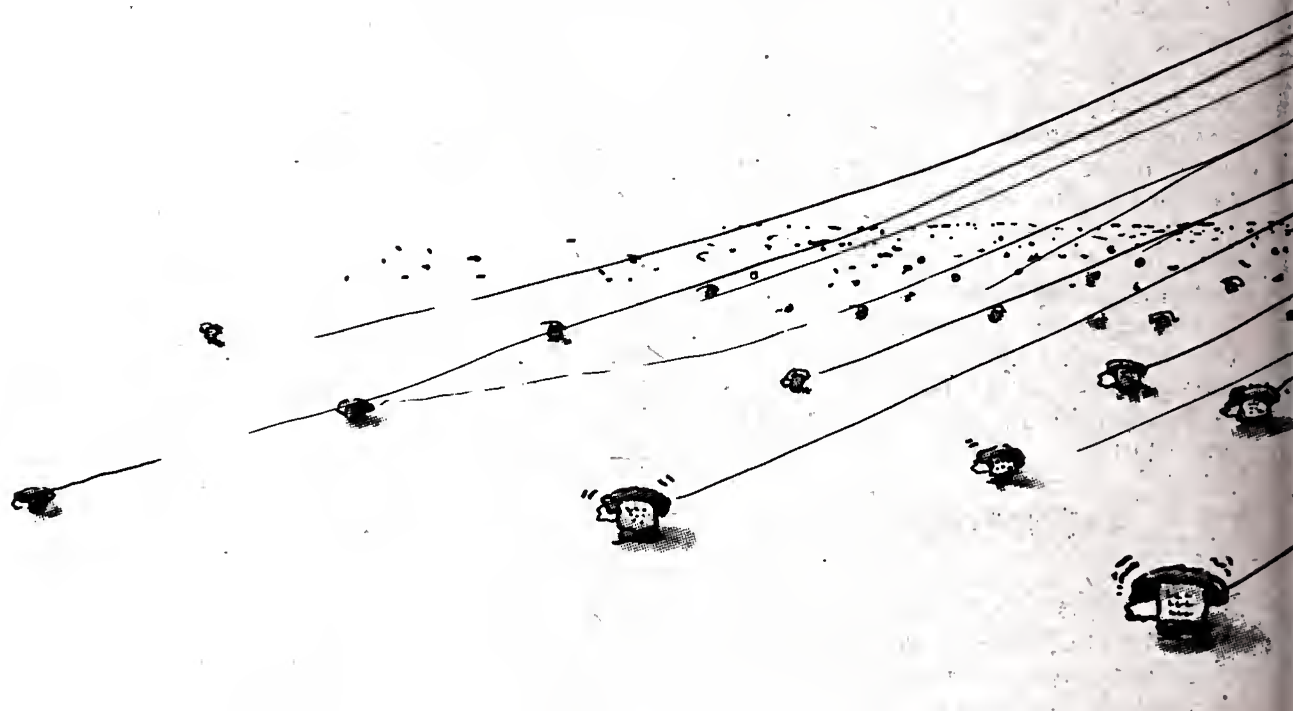

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TURNAROUND TIME

Larry Long

Q *I fought for and received authorization to award salary increases to my programmer/analysts that are almost double the increases for the rest of the company. My arguments centered on raising compensation to reach parity with other employers in the region.*

I had hoped that these increases — as much as 25% — would result in highly motivated workers. I'm aware of studies that show compensation on the low end of things that motivate computer people, but the priority for my staff was money.

If anything, morale is lower this year than last year. Where do I go from here?

The results of many studies on what motivates computer people uniformly show remuneration at or near the bottom. This conclusion was confirmed by what happened in your company. Lack of pay parity may cause someone to leave one job for another, but it is not an effective motivator. In a nutshell, highly motivated people are that way because they are inherently self-motivated or they have good managers.

Besides coordinating the efforts of a group, a good manager pays attention to the individual. A good manager makes a special effort to match assignments to the skills and interests of the individual. A good manager provides real as opposed to token guidance and support in the area of career development.

Granted, these individual activities take up valuable time, but in the long run, they provide a far greater contribution to the company than nitpicking memos and meetings for meeting's sake.

Q *In four months, we are scheduled to implement a homegrown manufacturing resource planning (MRP) system. I am the project leader. While drawing up the conversion plan, it became apparent that we had a real problem. The MRP system is such a radical change from the way we have traditionally handled manufacturing systems that the conversion calls for some structural reorganization and some facilities changes.*

The difference in approach and the scattering of personnel make parallel conversion impossible with current resources. We considered hiring 10 temporary people for two months, but that proposal fell through when the managers involved decided it was a waste of time and money to train temporary people on the old procedures.

I've recommended a direct conversion, but the users said this is out of the question. They offer no alternative. Do you have one?

With the implementation of more and more integrated, on-line information systems, direct conversion has become an increasingly appealing alternative to the traditional parallel conversion. The implementation of an MRP system is an invitation to go cold turkey with direct conversion. A phased conversion is not as applicable to MRP as it is to other systems.

Offset the greater risk of direct conversion with extra-thorough system testing and user training. I would suggest that you continue to press for a direct conversion effort.

Q *Three months ago, I was a victim of a companywide cutback. Although it is little comfort to me, data processing was not hit as hard as other departments.*

I am attempting to find a DP position (any position) in the local area. My 22 years of DP experience have gotten me some interviews, but I feel my age (47) has ultimately been the determining factor.

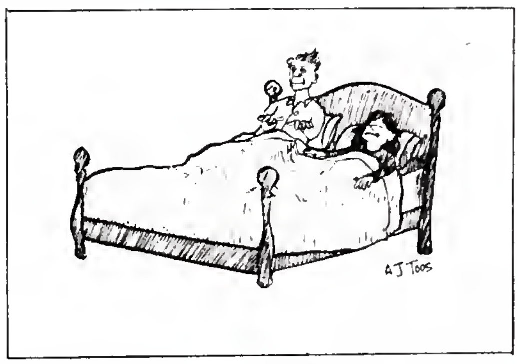
Could you suggest a search strategy for someone in my position?

Even though you may be willing to take a job at the salary of an entry-level programmer, potential employers feel that, over the long run, this is not a workable situation. Put your maturity to work for you. Look outside of the MIS function to the user departments. Most user departments would prefer to hire someone like you in a user liasion capacity rather than some young "techie."

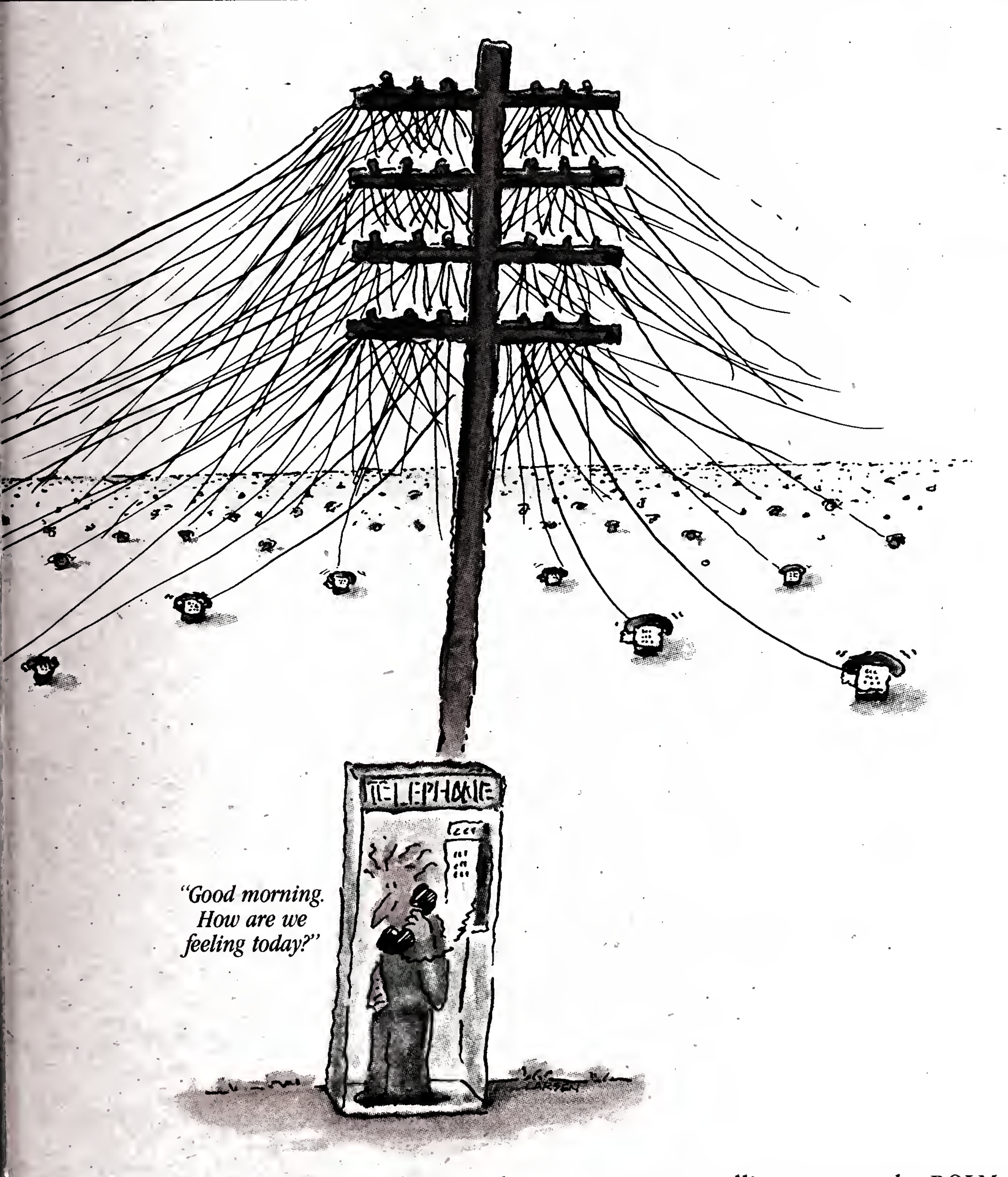
The year 1985 may well be the year of the user liaison (or business analyst or account executive). Although these types of positions have been around for some time, for the first time, user departments are recruiting such people in large numbers.

Check out opportunities in the user areas as well as MIS. And, don't forget your old company; substantial companywide cutbacks are often followed by the voluntary departure of many good people. I would expect that some of these openings will be filled with user liaisons.

Long, president of Long and Associates, is a consultant, lecturer and author in the field of information services. If you have a question you'd like him to address, send it to Larry Long, Editorial Department, Computerworld, *P.O. Box 880, Framingham, Mass. 01701.*



"Harry, you're computing in your sleep again."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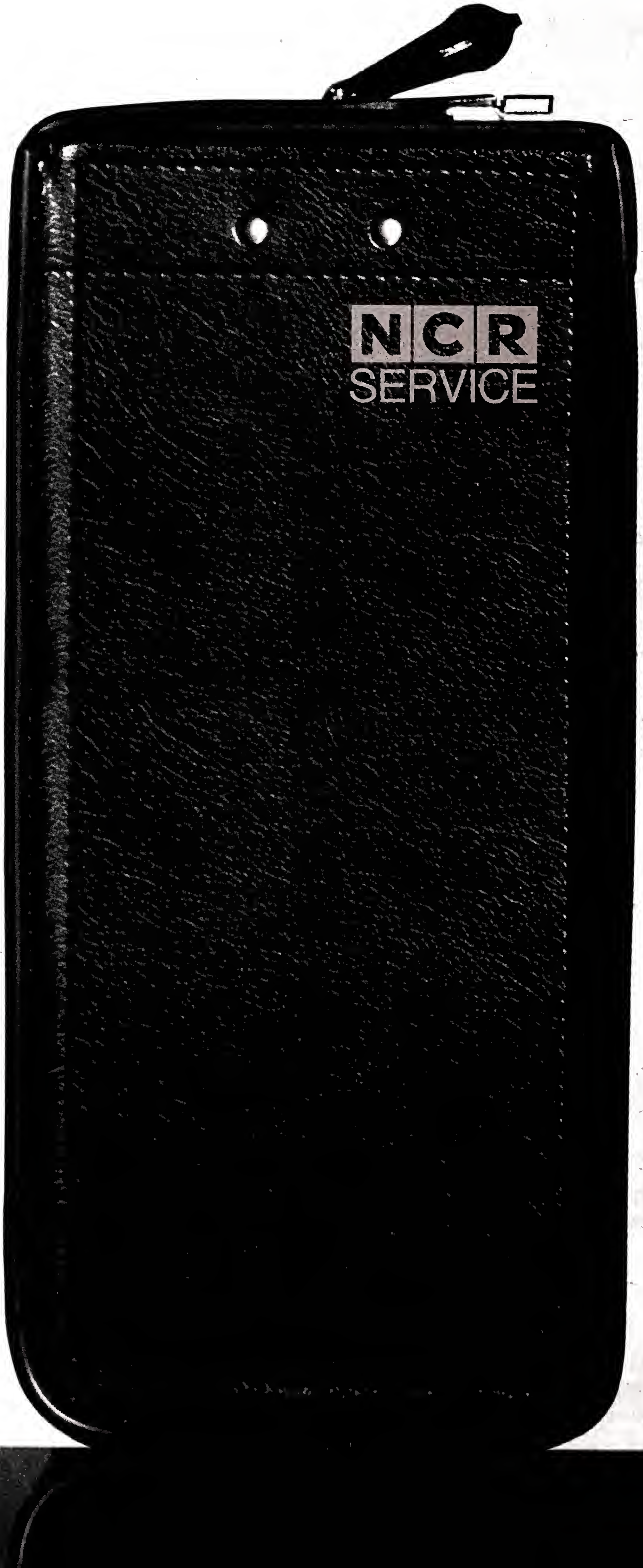
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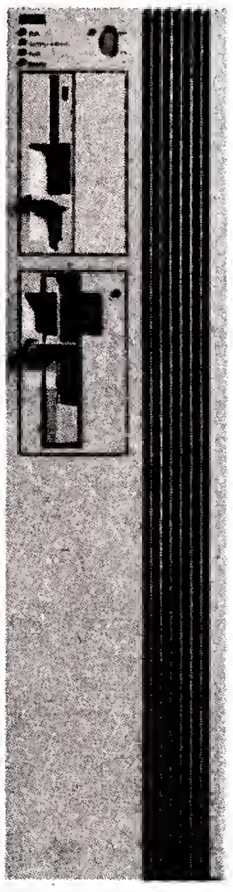

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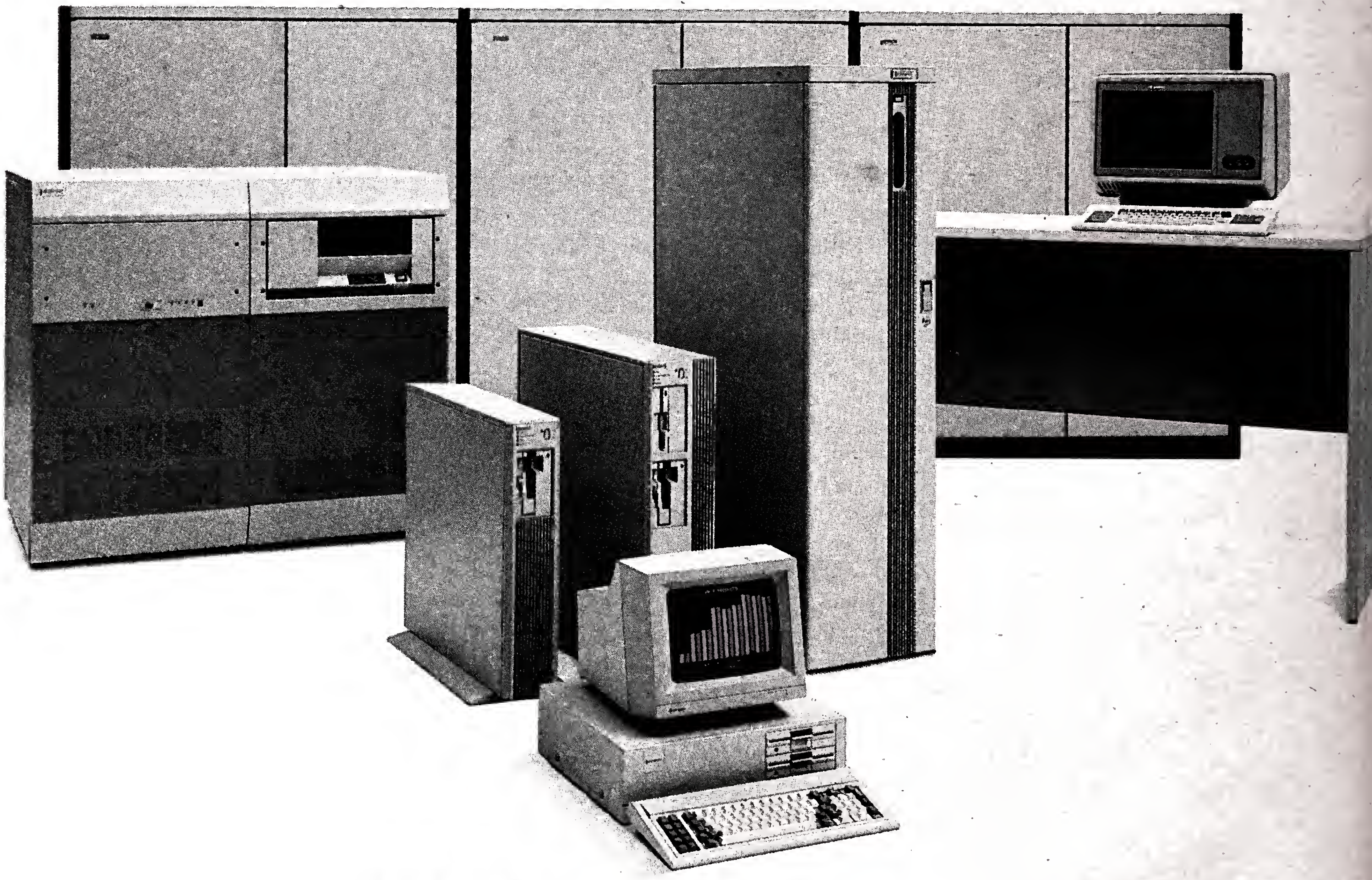


The UNIX* operating system from PC to mainframe.

CALENDAR

WEEK OF MAY 5

MAY 6, NEW YORK — **CICS/VS Internals.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 20-24 in San Francisco.

MAY 6-7, LOS ANGELES — **CICS/VS Performance & Tuning.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 20-21 in Fort Lee, N.J.

MAY 6-7, WAKEFIELD, MASS. — **Software Rapid Prototyping.** Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Department SRP, P.O. Box 3608, Torrance, Calif. 90510. Also being held May 9-10 in Orlando, Fla., and May 13-14 in Washington, D.C.

MAY 6-7, WASHINGTON, D.C. — **Software Maintenance.** Contact: Data Processing Management Association Educational Foundation Seminars, c/o Technology Training Corp., Department SMA, P.O. Box 3608, Torrance, Calif. 90505. Also being held on May 9-10 in Boston and May 16-17 in Atlantic City.

MAY 6-7, HOUSTON — **MVS Overview.** Contact: Acts Corp., 11910 Gate Way, Austin, Texas 78727. Also being held June 24-25 in Washington, D.C., and Sept. 9-10 in Austin, Texas.

MAY 6-8, BOSTON — **Relational Data Base.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402. Also being held May 13-15 in Los Angeles.

MAY 6-8, DALLAS — **EDP Software Maintenance.** Contact: Conference Manager, U.S. Professional Development Institute, 1620 Elton Road, Silver Spring, Md. 20903.

MAY 6-8, DALLAS — **Networking Personal Computers.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

MAY 6-8, SAN FRANCISCO — **Data Communications System Components.** Contact: Systems Technology Forum, 900 Fern Park Drive, Burke, Va. 22015.

MAY 6-9, DENVER — **CICS/VS Logic & Debugging.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 13-16 in Fort Lee, N.J., May 20-23 in Atlanta and May 28-31 in San Antonio.

MAY 6-9, FORT LEE, N.J. — **IMS/DC (Data Communications) Programming.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024.

MAY 6-9, WASHINGTON, D.C. — **Vtam: From Start to Finish.** Contact: On-Line Software International, Inc., Fort Lee Executive Park, Two Executive Drive, Fort Lee, N.J. 07024. Also being held May 13-16 in Denver, May 20-23 in Los Angeles and May 28-31 in Fort Lee, N.J.

MAY 6-10, HOUSTON — **Structured Systems Design Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77092. Also being held May 20-24 in Houston.

MAY 6-10, CHICAGO — **The James Martin Seminar.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

MAY 6-10, WASHINGTON, D.C. — **Hands-On Programming in the C Language.** Contact: The George Washington University, Continuing Engineering Education Program, Washington, D.C. 20052.

MAY 8-10, SAN FRANCISCO — **Local-Area Networks.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402. Also being held May 13-15 in New York.

MAY 8-10, LOS ANGELES — **X.25 and Packet-Switching Networks.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

MAY 9-10, WASHINGTON, D.C. — **Negotiating Computer Contracts.** Contact: Law & Business, Inc., Harcourt Brace Jovanovich, Publishers, 855 Valley Road, Clifton, N.J. 07013. Also being held May 30-31 in Boston and June 17-18 in San Francisco.

MAY 9-10, MINNEAPOLIS — **Personal Computer Local-Area Network Software.** Contact: Architecture Technology Corp., P.O. Box 24344, Minneapolis, Minn. 55425. Also being held May 16-17 in Washington, D.C., and May 22-23 in San Francisco.

WEEK OF MAY 12

MAY 12-16, SEATTLE — **APL '85.** Contact: Robert J. Gailer, Apartment C, 2416 E. Madison St., Seattle, Wash. 98112.

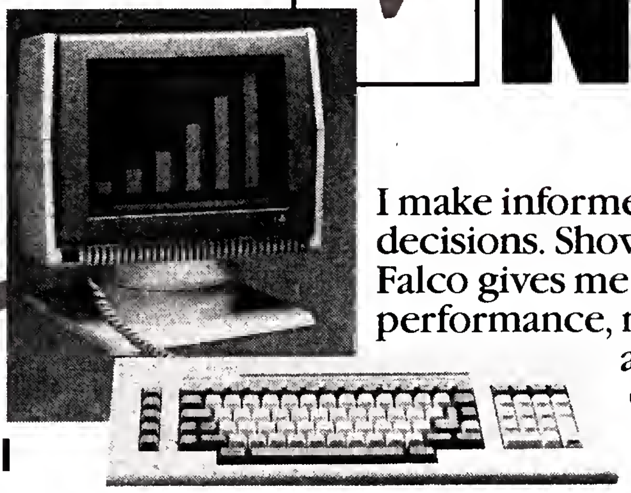
MAY 13-14, DALLAS — **Using Dbase II and the New Dbase III to Manage Information.** Contact: Professional Development Institute, North Texas State University, P.O. Box 13288, NT Station, Denton, Texas 76203.

MAY 13-14, CHICAGO — **Understanding Telecommunications Technologies for Non-Engineers.** Contact: Telestrategies, Inc., Suite 102, 6842 Elm St., McLean, Va. 22101.

MAY 13-15, WASHINGTON, D.C. — **Introduction to Data Communications.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015. Also being held May 29-31 in San Francisco and May 29-31 in Houston.

MAY 13-15, NEW YORK — **The**

See **MAY** page 44



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MAY

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Associated Information Managers Fourth Annual Conference. Contact: Associated Information Managers, 1776 E. Jefferson St., Rockville, Md. 20852.

MAY 13-15, TORONTO — **Controlling Software Projects: Management, Measurement and Estimation.** Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

MAY 13-16, DENVER — **The Fifth International Conference on Distributed Computing.** Contact: Earl Swartzlander, TRW Corp., Defense Systems, One Space Park, Redondo Beach, Calif. 90278.

MAY 13-17, SAN FRANCISCO — **Data Base Development Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77092.

MAY 13-17, HOUSTON — **Structured Systems Analysis Workshop.** Contact: Elise Rabalais, Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77092.

MAY 14-16, PARIS — **International Ada Conference.** Contact: Hans Horst, Virginia Polytechnic Institute and State University, Blacksburg, Va. 24061.

MAY 14-17, ST. LOUIS — **The Association for Integrated Manufacturing Technology's 22nd Annual Technical Conference and Exposition.** Contact: Association for Integrated Manufacturing Technology, Suite 800, 111 E. Wacker Drive, Chicago, Ill. 60601.

MAY 15-16, AUSTIN, TEXAS — **MVS System Tuning.** Contact: Acts Corp., 11910 Gate Way, Austin, Texas 78727. Also being held Aug. 22-23 in Dallas.

MAY 16-18, LOS ANGELES — **The Southern Califonia Computer Faire.** Contact: David Small, Computer Faire, Inc., 181 Wells Ave., Newton, Mass. 02159.

MAY 17, LOS ANGELES — **Independent Computer Consultants Association (ICCA) Interconnections '85.** Contact: ICCA, P.O. Box 27412, St. Louis, Mo. 63141.

WEEK OF MAY 19

MAY 19-23, NASHVILLE — **Software Jamboree.** Contact: Software AG of North America, Inc., 11800 Sunrise Valley Drive, Reston, Va. 22091.

MAY 20-22, HILTON HEAD, S.C. — **Audit Managers Symposium.** Contact: MIS Training Institute, Inc., 4 Brewster Road, Framingham, Mass. 01701.

MAY 20-22, SILVER SPRING, MD. — **1985 Trends and Applications Conference: Utilizing Computer Graphics.** Contact: Trends and Applications '85, P.O. Box 639, Silver Spring, Md. 20901.

MAY 20-22, WASHINGTON, D.C. — **Vtam Concepts and Facilities.** Contact: Acts Corp., 11910 Gate Way, Austin, Texas 78727. Also being held Aug. 12-14 in Houston and Nov. 18-20 in Washington, D.C.

MAY 20-23, VIRGINIA BEACH, VA. — **Navy/Micro OA '85.** Contact: Bostron Corp., Suite 716, 1511 K St. N.W., Washington, D.C. 20005.

MAY 20-24, BELLEVUE, WASH. — **C Programming Workshop.** Contact: Kathy Howard, Specialized Systems Consultants, P.O. Box 7, Northgate Station, Seattle, Wash. 98125.

MAY 21-24, PARIS — **Intelligencia International Exhibition and Congress.** Contact: Simtec Communications, 211, rue Saint-Honore, 75001 Paris, France.

MAY 21-22, TARRYTOWN, N.Y. — **Technology and Market Forecasting in Electronics.** Contact: Futurecast Learning Center, 40 Birch St., Redwood City, Calif. 94062.

MAY 22-24, KYOTO, JAPAN — **International Conference on Foundations of Data Organization.** Contact: Yahiko Kambayshi, Department of Information Science, Kyoto University, Kyoto 606 Japan.

MAY 22-24, WASHINGTON, D.C. — **Management Skills and Techniques for New and Prospective Managers.** Contact: New York University, School of Continuing Education, 575 Madison Ave., New York, N.Y. 10022. Also being held June 26-28 in New York.

MAY 22-24, NEW YORK — **Network Protocols and Standards.** Contact: Systems Technology Forum, 9000 Fern Park Drive, Burke, Va. 22015.

WEEK OF MAY 26

MAY 28-29, CHICAGO — **VS Cobol II.** Contact: Sysed, Inc., One Park Ave., New York, N.Y. 10016. Also being held May 30-31 in New York.

MAY 28-30, KINGSTON, ONTARIO — **15th Annual Symposium on Multiple-Valued Logic.** Contact: H.T. Mouftah, Department of Electrical Engineering, Queen's University, Kingston, Ontario K71 3N6, Canada.

MAY 28-31, NEW ORLEANS — **The Seventh National DEC-Compatible Industry Exposition (Dexpo South '85).** Contact: Angela Wright, Expoconsul International, Inc., 55 Princeton-Hightstown Road, Princeton Junction, N.J. 08550.

MAY 28-31, SAN FRANCISCO — **CICS Application Design.** Contact: Sysed, Inc., One Park Ave., New York, N.Y. 10016. Also being held May 28-31 in New York.

MAY 28-31, NEW YORK — **TSO IPF.** Contact: Sysed, Inc., One Park Ave., New York, N.Y. 10016.

MAY 29-30, DALLAS — **Opportunities & Pitfalls.** Contact: Ken Orton, Future Computing, Inc., 8111 LBJ Freeway, Dallas, Texas 75251.

MAY 30-31, WASHINGTON, D.C. — **Legal Issues in Acquiring and Using Computers.** Contact: New York University, School of Continuing Education, 575 Madison Ave., New York, N.Y. 10022.

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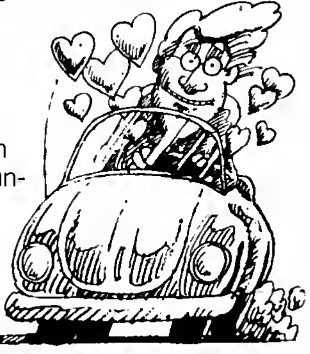

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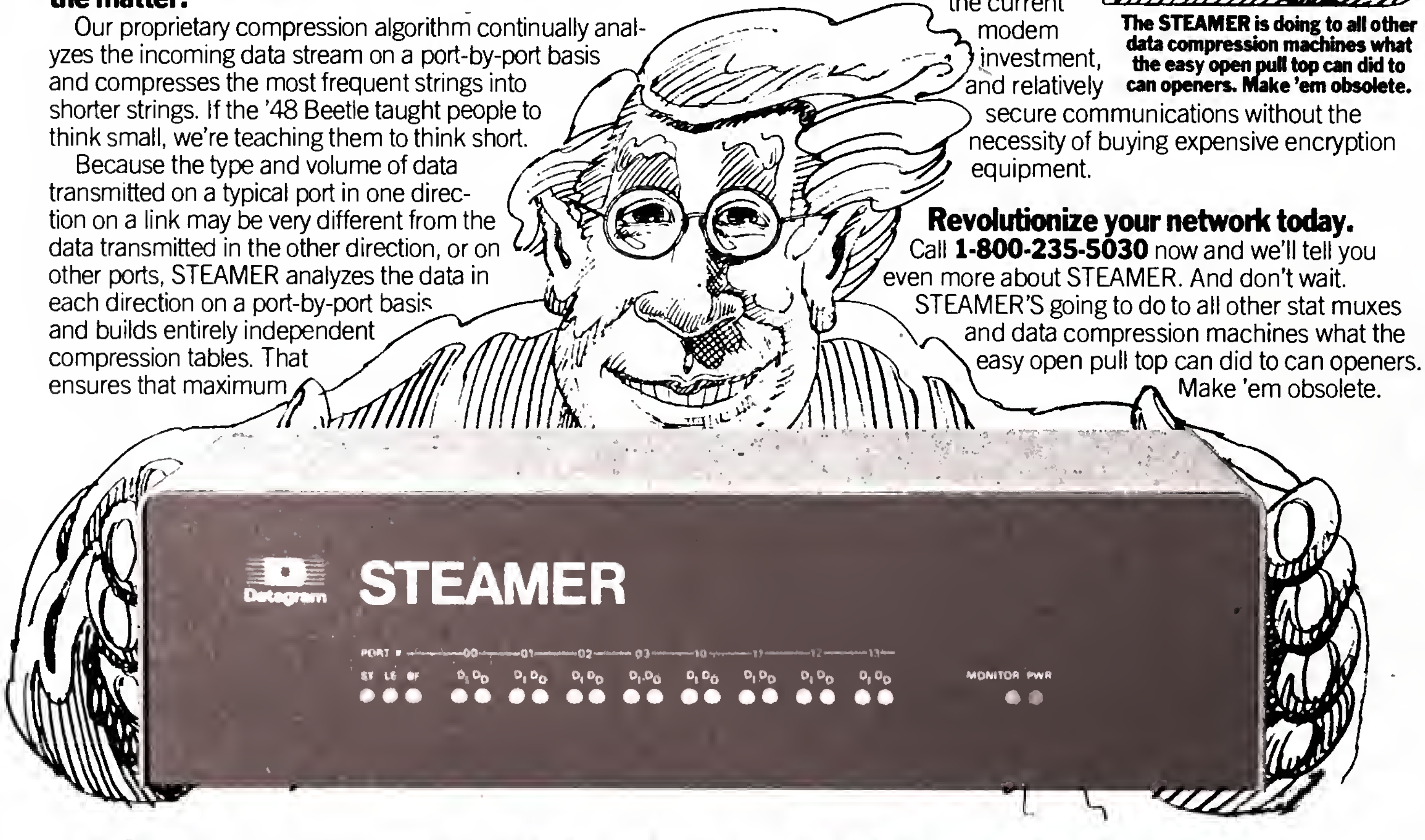

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EDITORIAL

Sound and fury

For better or worse, the critical health and safety issues concerning VDT use are moving through various state legislatures, where initial steps toward some sort of a VDT regulatory environment will likely be taken this year [CW, March 25].

The legislative debates on VDT safety will, if nothing else, summon forth the complete body of knowledge supporting or debunking the claims made about the hazards of VDT use. This is the good news, because people from both sides of the issue have presented salient information to back up their arguments. The bad news is that, given the same information and arguments, politically motivated legislatures cannot always be trusted to act reasonably.

Early reports from state legislatures indicate that pro-regulation groups, led chiefly by 9 to 5 and various employee unions, are gaining the upper hand over those railing against VDT regulation, such as the Computer and Business Equipment Manufacturers Association. The pro-regulators scored a victory late last month in conservative New Mexico, which enacted legislation regulating VDT use for state workers. The New Mexico regulation provisions include controlled room lighting, scheduled work breaks for VDT operators and adjustable workstations.

It appears that liberal states such as Massachusetts and California will likely approve similar regulations — the difference being the states' active consideration of regulation in the private sector as well.

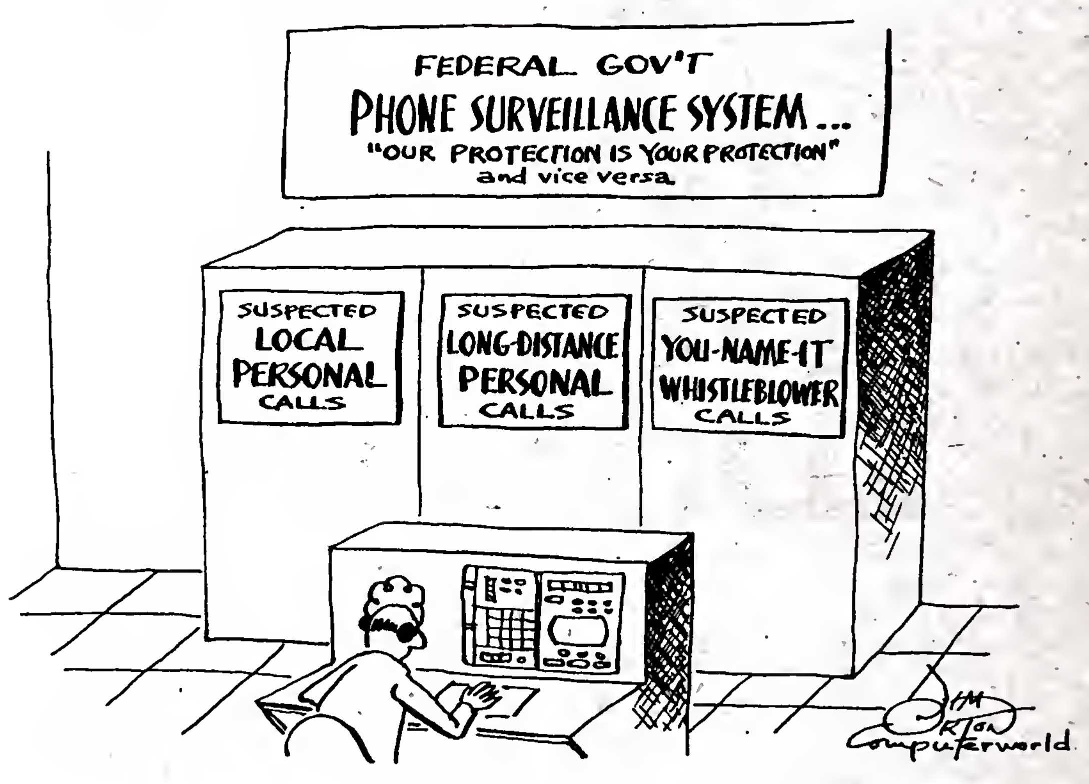
But the conflicting — and at times mutually exclusive — evidence from both sides of the VDT safety issue that filters in makes the proper course of regulatory action uncertain.

Consider the comprehensive survey the Data Entry Management Association conducted last summer of its members who work both with and without VDTs. Survey results showed that VDT workers do indeed experience a wide range of physical problems, including backache, fatigue and eyestrain. The survey also showed that a significant number of non-VDT workers suffered from the same ailments. As Dema asked when analyzing its results, is it the nature of office work and the general work environment that cause the problems, or is it high technology?

If high technology is not the culprit, as the Dema survey suggests, then it would be incumbent upon any wise employer to provide the necessary seating, controlled lighting and work breaks to eliminate general office health problems. A worker functions a lot better without pain.

However, the pro-regulators ask, can employers be trusted to act wisely? We'd have to ask the same of workers. In *Computerworld*'s offices, for example, dozens of employees work on terminals eight and more hours a day, but few take regular, permitted breaks from the terminal. Similarly, the federal government has mandated the installation of seatbelts in all cars sold in the U.S., but how many drivers actually wear them? Whether at work or on the road, old habits die hard, if at all.

Meanwhile, the sound and fury over VDT radiation emissions is abating. The VDT safety bill recently introduced in California does not address the issue, unlike an earlier unsuccessful bill. New Mexico's recent legislation does not address the issue either. The radiation issue, however, is far from decided. It awaits a definitive, comprehensive study by the Occupational Health and Safety Administration to sink some statistically sharpened teeth into arguments on both sides of the matter.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JIM ORTON
Computerworld

LETTER

Jobs, not employees, hard to find

I would like to present a different point of view from the article "Qualified programmers, analysts difficult to find" [CW, Dec. 31/Jan. 7]. It is difficult for an experienced analyst/programmer to find a decent position. Glenn Lukowicz said in the article: "[People do not] want to test or finalize their projects." To this I have to respond, "Wrong: I don't." And I know a number of good programmers who do. However, I do not like to be hamstrung in a company where the only thing that counts is the "political" aspirations of some would-be, half-God manager — a sentiment I share with a lot of good programmers.

John Kozial said in the article: "We don't have IBM equipment — we have [Honeywell, Inc.] — and we don't even expect to find Honeywell experience." I have some IBM Personal Computer and very limited IBM System/34 experience, but I have eight years of programming experience on minicomputer to mainframe systems (the latest three years on Digital Equipment Corp. machines). With a business degree and another eight years in accounting and business management, I *do* understand business applications. I am not just (barely) able to code, but I am also quite capable of designing and developing business-related applications with excellent standards, including full programmer and user documentation. And I take pride in my work, and so do some others.

Good people in their fields are sitting in boring, dead-end jobs, and some would go anywhere to get out of those jobs. How about a story entitled, "Where are the jobs?"

Name withheld by request

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VIEWPOINT

Careful shoppers find the best personnel

MANAGEMENT MATRIX
Walter F. Cuirle

What kind of a store do you go to when you go shopping? Let's say you have three options: You can go to a shopping mall, to a local Main Street store or to what we'll call a boutique.

Each type of store has its own image. Local stores offer independent ownership, experience, substantial inventory and a personal touch. A mall offers convenience. Individual stores in the mall may change, and many of them may be franchises with controlled or limited inventories. But what the mall's individual stores lack in experience, the mall as a whole makes up for in its breadth of offerings. The boutique is different. Like the stores on Main Street, the specialized inventory and personal touch is an important part of the boutique, but the inventory is small and high priced. There's an appearance of expertise but, like the stores in the mall, the boutique may be relatively new. Image is a large part of what the boutique has to sell. The hard question is this: Is it just image or is this place destined to become an established Main Street store?

Clearly, where you shop depends on what you're buying, and this is true when you're shopping for a new employee through an agency.

Employment agencies fall into the same categories as those stores. There are large, full-service agencies comparable to malls. Agent turnover may be fairly high and the level of expertise among the agents may vary a lot, but, in many cases, the breadth of their offerings compensates for that. You would probably call there for a good deal on, say, a computer operator or junior applications programmer — salaries of up to $20,000 a year or so. Sorting through the stack of resumes you get when you go to the employment mall is a lot like sorting through a stack of jeans at a sale table.

The smaller firms often have enough experience in the industry to offer more specialized service. You know them, your colleagues know them — they've been around awhile and there is every reason to believe they'll stay. When you call, you'll get personal attention from the same person you talked to last month or last year. You don't have to explain the terms you use. The inventory is there, but you are only shown a handful, and those are carefully considered and usually close to the mark the first time. You may shop here for supervisory personnel or key employees like a senior systems analyst or a lead programmer — salaries of $35,000 a year or so. You pay a little more than you do at the mall, but it's clearly worth it in the time you save and the quality you get. It's like shopping at the Main Street clothing store with its knowledgeable owner at your elbow.

> ”
>
> *The smaller firms often have enough experience to offer more specialized service. You know them — they've been around awhile and there is every reason to believe they'll stay.*

Something strange happens when it's time to look for employees with highly specialized skills or those at the upper management level — a manager of data base administration or applications programming, for example, or annual salaries of more than $40,000. People don't really expect to find what they want at the employment mall in this case, but for some reason they will abandon the Main Street shop as well and succumb to the employment boutique's carefully crafted image.

Caution is justified. After all, not only is this level of salary higher than usual, but perks and a whole array of supplementary benefits are often involved as well. Be just as cautious about the agency as you are about the applicant. How long has it been around and who are its other clients? Does it match the applicant to your needs, or does it try to convince you to change your needs to suit the applicant? How big is its "inventory" of applicants, and where do they come from? Are you dealing with a future Main Street shop or with a trendy boutique?

Watch for two things — exclusive-listing retainers and front-loaded nonrefundable fees. High-end employees are hard to find. It takes some time, so it may be reasonable for an agency to want money up front. However, some agencies set this up as a fixed nonrefundable retainer fee, payable whether they succeed or fail, and throw in the stipulation that you list the opening exclusively with that agency for some period. The logic of the exclusivity is generally hard to follow, but it is particularly so if that so-called retainer is completely separate from the finder's fee. The finder's fee itself may be set up as a percentage of salary or of the total package. If that fee is demanded in full, up front within 30 days, and you have no claim to a reasonable refund if your new employee quits on the 30th or doesn't work out by the 31st, then maybe you should look around some more.

A good place to start is your familiar supplier on Main Street. If it can't meet your requirements, it can probably refer you to a reputable shop that can. In the long run, it's good for both your business and theirs. But while you're there, why not take a little extra time to describe your special needs? You never know what there might be in the back.

Cuirle is a senior associate with Nicholas DeMaio Associates in Bryn Mawr, Pa.

'Credibility gap' undermines user confidence

HUMAN CONNECTION
Jack Stone

Searing concerns and apprehensions from the public and Congress about U.S. Department of Defense (DOD) budget and procurement policies seem to be making a dent in the DOD's recalcitrance to "clean up its act." The mark is slight, mind you, but a dent nonetheless.

Consider the following developments:

- The U.S. Navy announced a massive change in its personnel policy, recognizing that in the selection of senior leaders, procurement knowledge and experience (plus a Harvard Business School degree) would weigh heavily in a candidate's favor, as opposed to strictly military operations experience.
- A White House spokesman said the executive branch would consider negotiating budgetary line items, but only where waste and procurement stretch-outs would lead to savings.
- A U.S. Air Force representative said the continued negative press on spare parts overcharges and procurement fiascos was "undermining public confidence" in the military.

Citizens vitally interested in the defense posture of the nation are wondering just what in the world is going on at the DOD. Of course, the bad press is weakening the nation's confidence — and justifiably so when the DOD's blatant, if not ludicrous, foul-ups in the procurement of spare parts are considered.

Information center managers should take a hard look to make sure their centers are not in situations akin to the DOD's.

Many outside observers believe the events reported by the press are symptomatic of gross mismanagement. After all, the DOD is known to possess truly unlimited funding for data processing power and all the management and technical brains to go with it. So, in the absence of full knowledge and understanding of what goes on there, one has to conclude that DOD leaders either don't know or don't care about how the procurement process works.

> ”
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> *The DOD is known to possess truly unlimited funding for DP power and all the management and technical brains to go with it. So, in the absence of full knowledge and understanding of what goes on there, one has to conclude that DOD leaders either don't know or don't care about how the procurement process works.*

In the DP center, conditions are ripe for a credibility gap and diminution of user confidence when some or all of the following conditions exist:

- A continual stream of underground murmurings is picked up in the user areas about how the center "continues to make same mistakes" and "doesn't know or doesn't care" about fixing them.
- User department heads routinely complain about the excessive corporate resources allocated to the center, at the expense of the rest of the organization, and how it is being "frittered away" without adequate review and control by a corporate oversight committee.
- Managers regularly voice concerns over the length of time it takes for new applications to come onstream and "how the responsiveness of the center seems to be lessening with time rather than improving."

How can you combat the credibility problem? Obviously not by a wholesale change in center operations — in no way is this feasible. A more practical way is through an expert communications program with the user establishments — a public relations program, if you will — to ensure that center accomplishments are fully appreciated, development projects are on course with respect to corporate objectives and the inevitable systems problems are being attended to with alacrity. ‡

Stone is a Washington, D.C.-based independent management consultant, educator and writer, specializing in DP human communications and personnel development.

The second whole-mirth 'Computer-Aided Life Catalog'

READER'S PLATFORM
Walter Murphy

We at the Computer-Aided-Life (CAL) Catalog take the future seriously. We listen even when the most skeptical prognosticators predict that the future without computers and technology would be like a car without wheels. We also listen to our customers, and they seem to be saying, "Make our lives simpler, our decisions easier." And this is fortunate for us (that is the CAL premise). CAL combines the inevitability of computers and technology in our lives with practical applications. One customer wrote, "Until I read your CAL Catalog, I thought a silicon chip was a high-tech nacho. What a revelation! I ordered the diatonic utensils (from last year's catalog), lost 10 pounds and told any friends, 'Better living through technology, chubby!' "

This year's CAL concentrates on personal enrichment products. We try to use the technology to make life easier, whether it's dressing, cooking, complaining, making decisions or sorting through the plethora of information we are assaulted with every day. You've let CAL into your homes and offices — now we want it to be a part of your lives.

For those of you have trouble deciding what to wear and when and how to wear it, the CAL system's Jeeves is for you. Jeeves is simply an integrated optical, voice and data base system that functions as your own personal dresser. Optical scanners size you up and down and will verify Color Coordination, Seasonal Selection, Fashion Trend Analysis and Natty/Chic Quotient. You can make your own fashion statements without creating a public outcry.

A dressing adviser

The Jeeves data base also tracks your dressing habits so that you are as unpredictable as hemlines in Paris. Be madcap and a fop, but have good fashion sense! Jeeves prompts you for clothes selection or analyzes your selection with an optical scanner for the occasion and the proper alignment of pleats, knots and cuffs. Sensible prompts like "Green and red only look good on Christmas trees" or "Didn't you wear that just last Tuesday?" or "That looks like an explosion in a polyester factory" or "Would you mind dimming that tie, please?" virtually eliminate sartorial blunders. With Jeeves, you'll never make the fashion statement, "Sure I get dressed in the dark. With these clothes, wouldn't you?"

If your life is so busy that you can't even remember what you had for supper last evening, Cooktek is for you. A nutritionally balanced system that gives new meaning to menu selection, Cooktek frees you from the bother of deciding what you want to eat and then cooking it. It's like an in-house diner without the ugly place mats.

You are presented with the Menu du Jour, from which you select your meal, providing it's fresh and good for you. Cooktek integrates motherly good sense with technology for those living alone.

The Cooktek Food Delivery System (FDS) interfaces with virtually any microwave oven. This model prepares your selection and offers useful advice while you are eating: "Don't eat so fast" or "Is that spoon too small or would you rather have a shovel?" or "Chew your food — don't inhale it!"

Cooktek is available in three dietary versions: Mainframe (meat-n-potatoes), Miniveggie (no red meat) and

See **CAL** page 49

Murphy is a technical writing consultant in Demarest, N.J. His first whole-mirth computer-aided life catalog appeared last year in Computerworld *[CW, March 12, 1984].*

LETTERS

Concept not a threat

Richard Stallman, vocal advocate of free software and subject of the letter "Free software philosophy refuted" [CW, March 4], is certainly not a "threat" to any legitimate software developer. His promotion of the concept of free software carries no unlawful purpose. Stallman has freely distributed the fruits of his labor to a wide community of users and has tried to encourage a "communal" sharing of enhancements to his software. He is not a thief.

Certainly not a "parasite" at MIT's Artificial Intelligence Laboratory, Stallman has independently produced a free text editor that has inspired many clones and imitations — most of which are commercial (not for free) and vastly inferior to Stallman's original. Stallman gives away source code, too.

Those who have extensively used Stallman's text editor can appreciate the value of this free software. The editor is by far the best I have ever used and is infinitely better than any of the reasonably affordable commercial competition.

The group in which I work has benefited enormously from the using the text editor and has also made excellent use of Columbia University's Kermit programs. Free software can probably only be produced through some type of subsidy and will never be as plentiful as commercially motivated software. But instead of feeling threatened by it, users should rejoice when offered free software. Some of the best things in life are indeed free.

Tad Marshall
New York

CAL from page 48

Microbiotic (no meat or aggressive vegetables).

It seems that the person you want to complain to always has an answering machine. If you become furious at the mechanic who installed truck tires on your subcompact, and your mind is momentarily idled when his answering machine requests that you leave a message, then Canned Heat is for you.

Package for tirades

A compact recorder that is easily installed on your phone, Canned Heat is a series of prerecorded tirades for all occasions. When asked to leave a message, you can simply enter a three-character code and listen as your anger and frustration is transmitted through the receiver. Each message can be personalized with your name: "This is Mr. Murphy, and I want to speak to the cretin who validates Darwin's Theory!" Or you can record your own messages for later use.

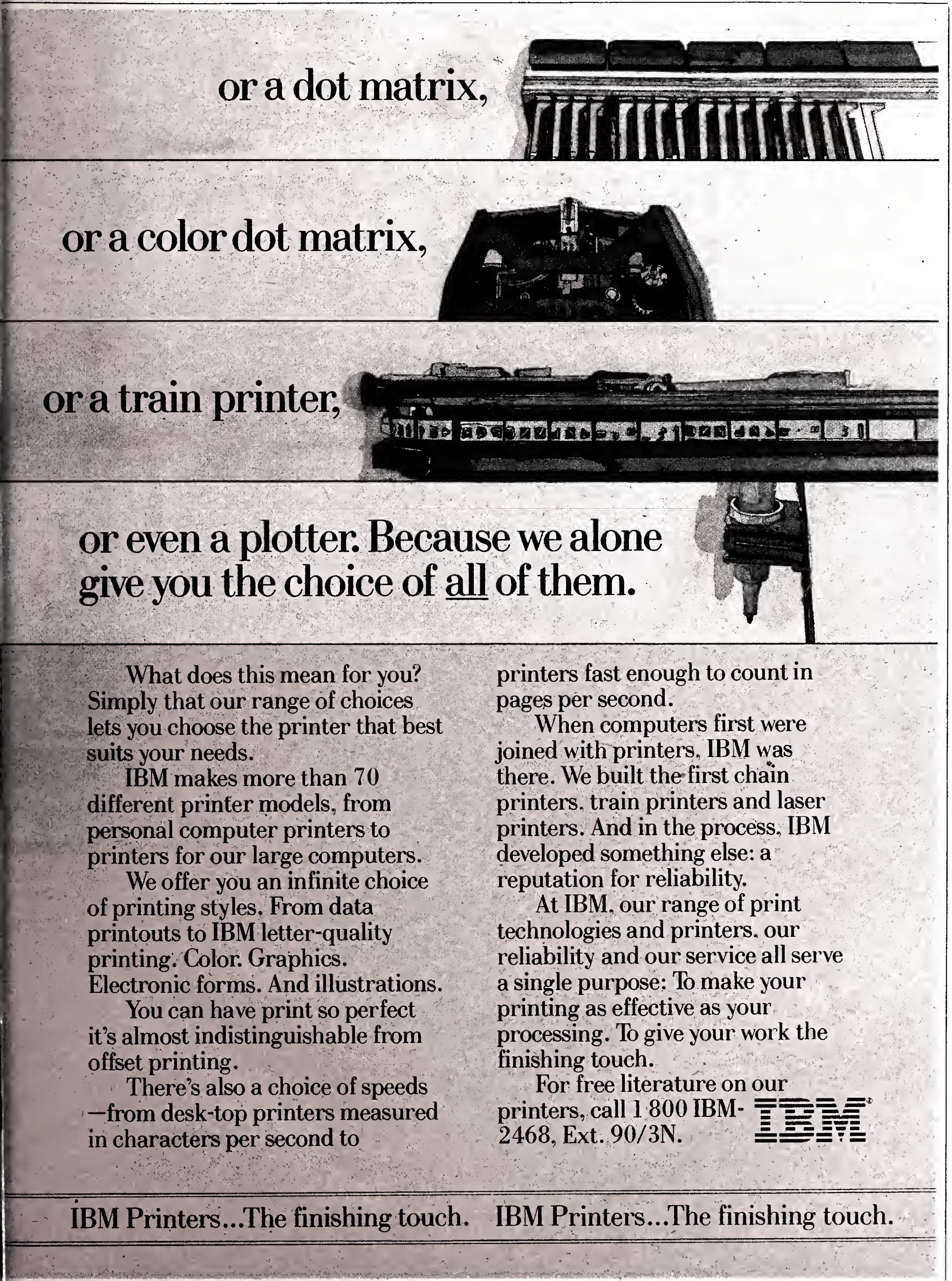
Canned Heat also allows you to leave increasingly hostile messages to those who think they have better things to do than return your calls: (mild) "Gimme a call when you get a chance; (annoyed) "There's a problem with your bill"; (livid) "I realize you're busy fleecing other unsuspecting citizens, but get back to me before I call my lawyer"; (out of control) "!!&%$#, in spades, buddy! I have your wife and kids!"

Advice is one thing a true whiner is never without, but knowledge should also be readily available. With the Smartalex remote communications system, you can remove from your vocabulary the word "Duh!" and the phrase "Gee, I didn't know that!"

Smartalex allows you to analyze other people's conversations, access any popular data base and have facts and opinions transmitted to you almost instantaneously. Smartalex is part modem, speech synthesizer, remote display, tutor and all-around know-it-all.

Whether you want to flaunt your knowledge shamelessly or be better informed, Smartalex gives you a wealth of information for the mere price of data base connect chords. Be able to correct colleagues with statements like "That's right, rebel insurgents in Central America did plot to kidnap Julio Inglesias" or "Where do you get off, buddy! I'll have the exact figures in a minute."

If you order now, all of this year's products receive the CAL lifetime guarantee. However, it is a lifetime as measured by Soviet presidential tenure. ‡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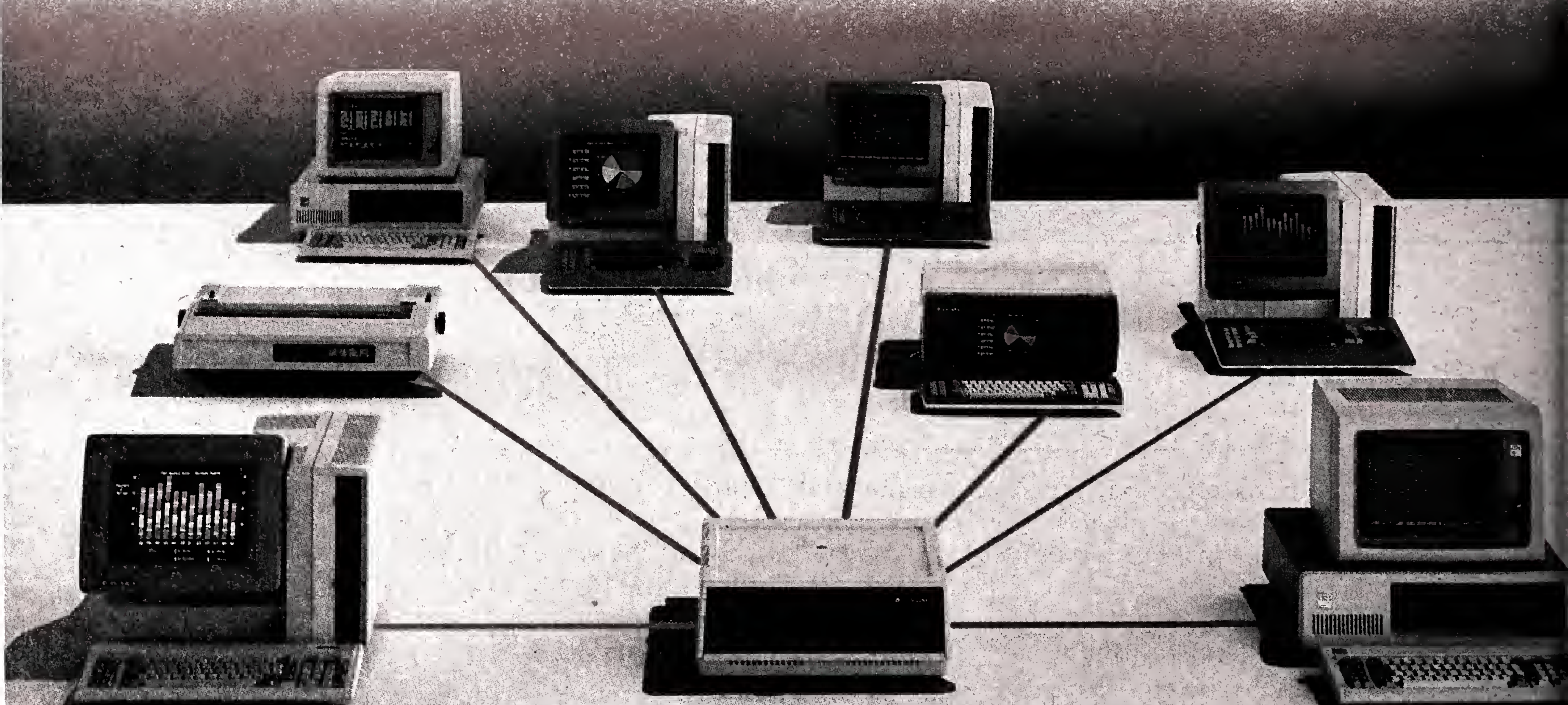

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SOFTWARE & SERVICES

Small tasks reap AI gains more quickly, report finds

By Maura McEnaney
CW Staff

Companies considering a foray into artificial intelligence may reap immediate benefits by applying expert systems technology to smaller tasks, such as configuring computer systems and planning the repair of telephone cables.

That was one of the findings of a recent report on expert systems technology from London-based Ovum Ltd. The report, titled "The Commercial Applications of Expert Systems Technology;" stated that the AI applications showing the first real return on investment tend to be those that are "less glamorous." Ovum defined expert systems as applications that extract inferences from a knowledge base.

While financial services, oil exploration and military applications are good candidates for expert systems development, "modest or small expert systems are likely to produce quicker real benefits," the report said. These smaller systems, it explained, are often used to support equipment design and maintenance and fault diagnosis. They embody the expertise of technical personnel rather than highly trained experts, the report added.

Areas in which AI is attracting a lot of research attention, including medicine and teaching, may not be the areas that produce appropriate commercial applications, according to the Ovum report. "In these areas an expert system will be replacing an established human expert directly, and the financial benefits will not be very great."

Two major decisions facing companies considering the use of an expert system are the scope of the application and whether or not the expert system will be developed in-house. According to the report, "[the] benefits of the in-house, small system approach are often overlooked . . . It can bring early benefits at low cost and

See **EXPERT** page 68

SOFTALK/JOHN GALLANT

Vendor synergy reaps deals

Sometimes it is hard to believe that the computer industry has yet to mark its 50th anniversary. Surely in the scant four or five decades that have passed since modern information processing technology was born there has been more written about the computer era than any other period of mankind's existence, including the dark centuries before recorded history.

The software industry is an even more recent phenomenon. Only a handful of independent software vendors can trace their roots back more than a decade — fewer still can outline a genealogy of more than a decade and a half. Despite the sheer volume of software companies that exists and disregarding the impression of size their massive advertising efforts foster, the biggest of the big software vendors today is dwarfed in revenue by some of its more established hardware brethren.

That is an important fact to remember, especially in light of the increasingly embraced view that software is beginning to drive the whole computer industry. Some pundits have even gone so far as to augur that not so very far into the future, hardware, like razor handles, will be given away free to sell software, the equivalent of razor blades.

Outlook ignores problems, strengths

Such an outlook neglects some important difficulties that software vendors face and it ignores some vital strengths that hardware companies maintain to this day. Despite the relative immaturity of the computer industry, hardware companies exhibit more legitimacy than the

See **VENDORS** page 68

SOFTLINE
T. Capers Jones III

Maintenance push is on

After more than 30 years of software production, the factors that impact programmer productivity are gradually becoming clear. There is one major topic, however, that remains largely unknown and is significantly underreported — improving productivity through software maintenance and enhancement.

This is unfortunate since, as the industry matures, more effort will be devoted to maintenance and enhancement. It is time that the productivity factors for this work are clearly understood.

Most of the algorithms and rules of thumb for evaluating software productivity were developed for new programs and tend to be inaccurate for maintenance and enhancement purposes. Even the basic law of software development — that small projects are more productive than larger ones — turns out to be incorrect for maintenance and enhancements.

The overhead costs of exploring the system or program to be modified are so high that small maintenance and enhancement revisions of only a few lines of code are less productive than larger ones. Surprisingly, maintenance and enhancement productivity tends to peak

See **CODE** page 52

Jones is a consultant for Nolan, Norton & Co. in Lexington, Mass., and the author of two books and numerous articles and reports on software quality and production. He is a regular contributor to Softline.

- Vmark Computer unwrapped the Universe DBMS for porting software developed under Pick Systems' Pick operating system to Pyramid Technology hardware/**53**
- Digital Communications Associates announced communications software that allows transfer of binary files between micros with its Irma board and IBM mainframes running VM/CMS/**56**

INSIDE

Systems Software/**56**
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CODE

from page 51

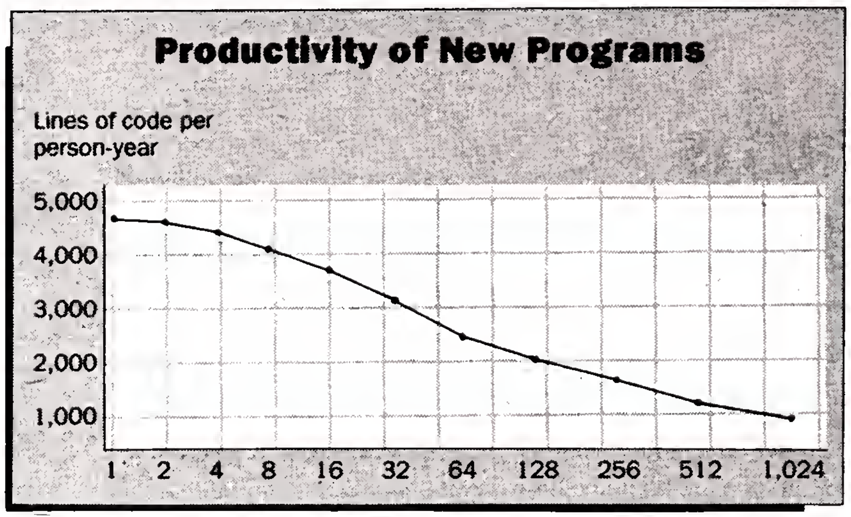

Figure 1

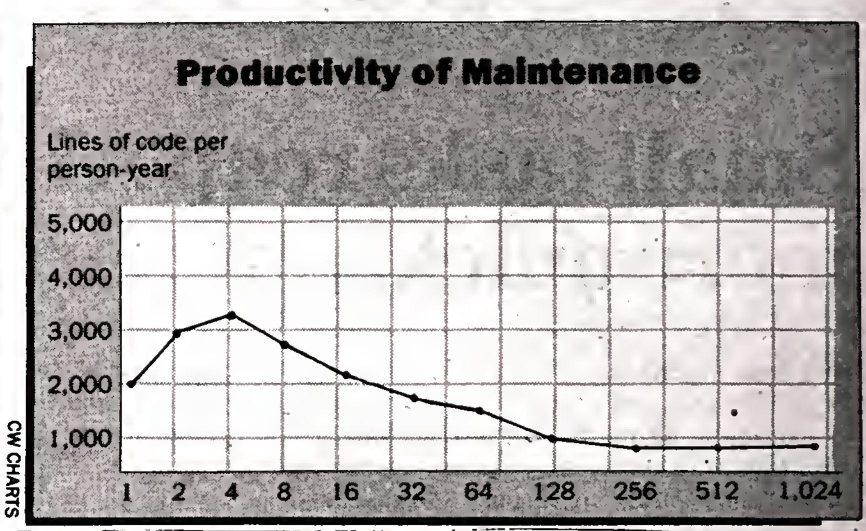

Figure 2

when the size of the revision is about 1.5% to 3% of the size of the program being modified.

For example, when updating a 10,000-statement Cobol program, productivity will often be higher when adding 300 new lines of code than when adding only 10 or 15, when productivity rates are expressed as function points or lines of code per unit of time. Very large program updates, such as adding more than 10,000 lines of code to a 100,000-line program, actually begin to slide back down the productivity curve.

Figure 1 illustrates typical Cobol productivity rates for new program development, while Figure 2 indicates typical Cobol productivity rates for maintenance and enhancement projects.

While many of the factors that affect maintenance and enhancement productivity, such as staff experience, tools and the like, are identical to those that affect new programs, there is one unique factor of great significance: the structure and status of the program or system being modified. As an experiment, 26 maintenance and enhancement programmers were interviewed to determine what impact they thought structured coding had on maintenance. Although their responses were subjective, they were quite revealing.

The programmers felt that if the source code was well-structured and cleanly segmented, they could make any given change in about one-quarter the time it would take to update a poorly structured program. The programmers also said carefully structured code lowered the probability of adding new bugs during modification by as much as 50%.

Ensuring software quality during maintenance and enhancement is important. For new Cobol programs, the total quantity of bugs typically averages about 30 per 1,000 source code statements. However, adding new code to an existing software program is a much more hazardous undertaking. Some experts report that the error density in changed and updated code can run to up to three times that of new code, leading to as many as 90 bugs per 1,000 source code statements. This is one of the reasons why attempts to modify purchased software packages so often come to grief.

The current findings on maintenance and enhancement productivity can be summarized as follows. Even revising a well-structured program can incur additional costs that can lower design, coding and testing productivity levels below new program norms.

Productivity might run 10% to 25% below rates for generating the same amount of new code, with the important distinction that productivity will usually peak when the size of the update is 1.5% to 3% of the size of the program being modified.

Revising a poorly structured program may yield a productivity increase 25% to 75% below the rate for the same amount of new code and a bug rate up to three times that of new code.

As a final point, the programmers were asked to discuss how much code should be changed in an existing program before the whole system should be redesigned. For carefully structured programs, new code totaling 50% to 60% of the original system could be absorbed fairly safely, they said. For poorly structured programs, scrapping the original program at the earliest opportunity was the subjective conclusion, with a rough estimate that after adding 10% to 15% new code, the maintainability quotient would approach disaster levels.

For many years, the importance of maintenance has been significantly underestimated. The work of a few dedicated specialists such as Girish Parikh, Nicholas Zvegintzov and Eric Bush has begun to change the perception of maintenance. It is gradually being recognized as a major technical discipline with its own unique productivity and quality characteristics.

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Vmark interactive DBMS out

NATICK, Mass. — Vmark Computer, Inc. has announced the Universe interactive data base management system.

This product is said to enable applications software that is developed under Pick Systems' Pick operating system to run under AT&T's Unix on Pyramid Technology Corp. hardware.

A spokesman said Universe is also compatible with applications software developed under Prime Computer, Inc.'s Prime Information data base management system running under the Primos operating system.

Vmark has an agreement with Pyramid to market the Universe system and other office automation software and application generator tools with Pyramid's 90 series superminicomputers.

Universe is not available separately.

A spokesman said the Pyramid version of Unix incorporates features of AT&T's Unix System V and University of California at Berkeley 4.2 versions.

Vmark will offer eight Pyramid systems providing support from 32 to 128 users.

Prices for the Pyramid systems range from $150,000 for the 90X model to $350,000 for the 90MX dual-processor model.

Vmark is located at 5A Strathmore Road, Natick, Mass. 01760.

Micro communications software boasts support of IBM machines

WALTHAM, Mass. — Support for the IBM Personal Computer AT has been added to Management Decision Systems, Inc.'s (MDS) microcomputer-to-host communications software.

Express-Mate/Link Version 1.1 links the IBM Personal Computer, Personal Computer XT and AT and compatibles with MDS' mainframe Express decision support system (DSS) under Prime Computer, Inc.'s Primos and IBM's VM/CMS operating systems.

Version 1.1 includes built-in communications and file translation facilities, a spokesman said. Express-Mate/Link allows data to be uploaded to Express and stored for later retrieval by the micro application. For downloading of data, users can transfer selected portions of mainframe DSS applications to the micro.

Express-Mate/Link includes a menu-driven interface, scrolling capabilities, command recall and automatic login. The product requires an asynchronous port and Hayes Microcomputer Products, Inc. Smartmodem or compatible.

Express-Mate/Link Version 1.1 is priced at $295.

MDS is located at 200 Fifth Ave., Waltham, Mass. 02254.

OBS Software unwraps tool for MVS, VM

SAN FRANCISCO — OBS Software, Inc. has announced Excellink, a micro-mainframe file transfer and communications software package for IBM's MVS and VM operating systems.

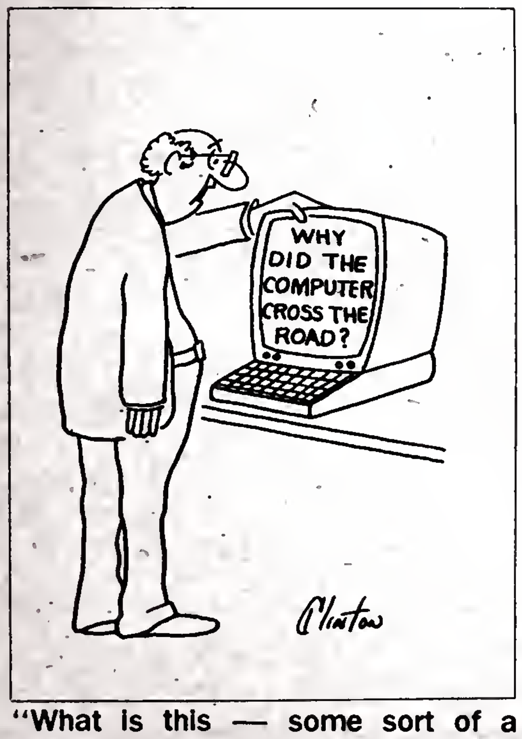
A spokesman said Excellink's IBM 3101 terminal emulator and protocol converter provide IBM 3270 emulation capabilities. The product reportedly allows file transfers between the micro and the mainframe over dial-up lines or coaxial connections.

Excellink supports coaxial connections through a Digital Communications Associates, Inc. Irma board or dial-up connections for line-by-line emulation of dumb terminals.

Excellink is said to transfer files through IBM's TSO and CMS at speeds up to 9.6K bit/sec. After logging on, users may return to the micro operating system without dropping the host session and network connection, according to the vendor.

The microcomputer portion of Excellink, including the IBM 3101 terminal emulator, is priced at $150. The mainframe portion is priced at $5,500.

OBS Software is located at 115 Sansome St., San Francisco, Calif. 94104.


WHY DID THE COMPUTER CROSS THE ROAD?
Clinton

"What is this — some sort of a joke?"

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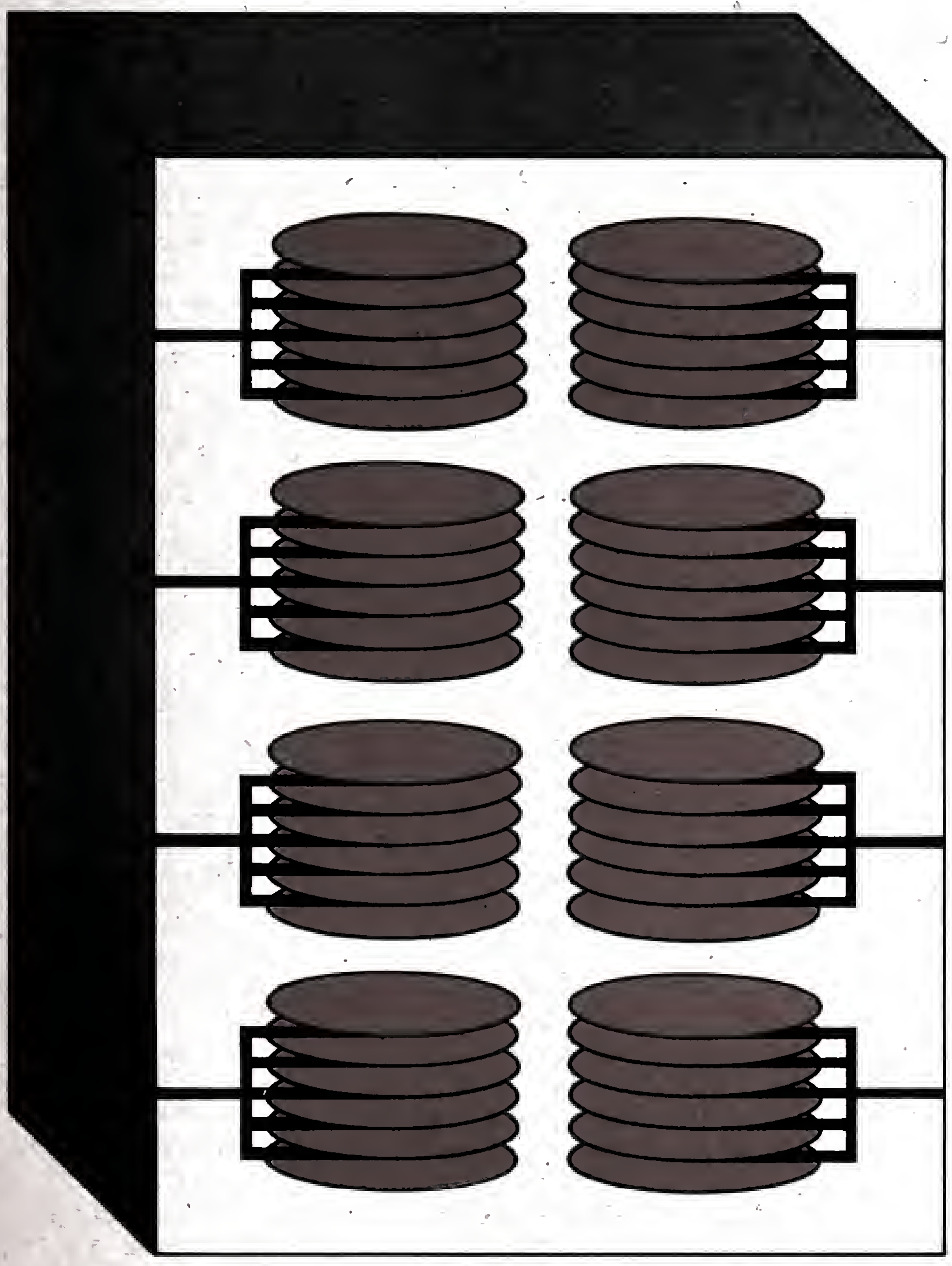

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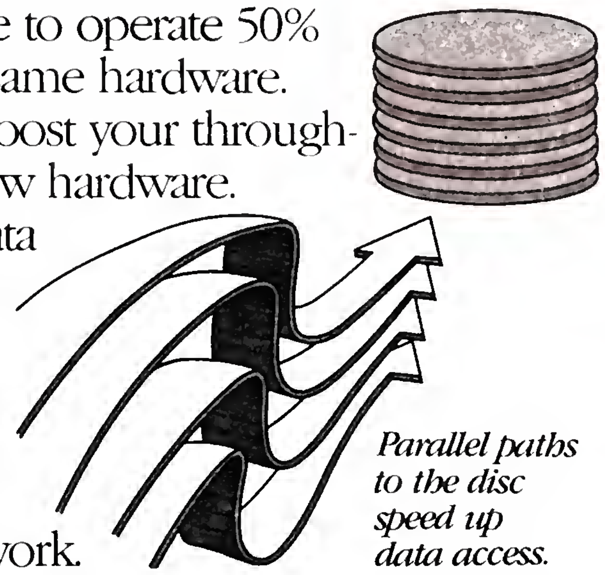

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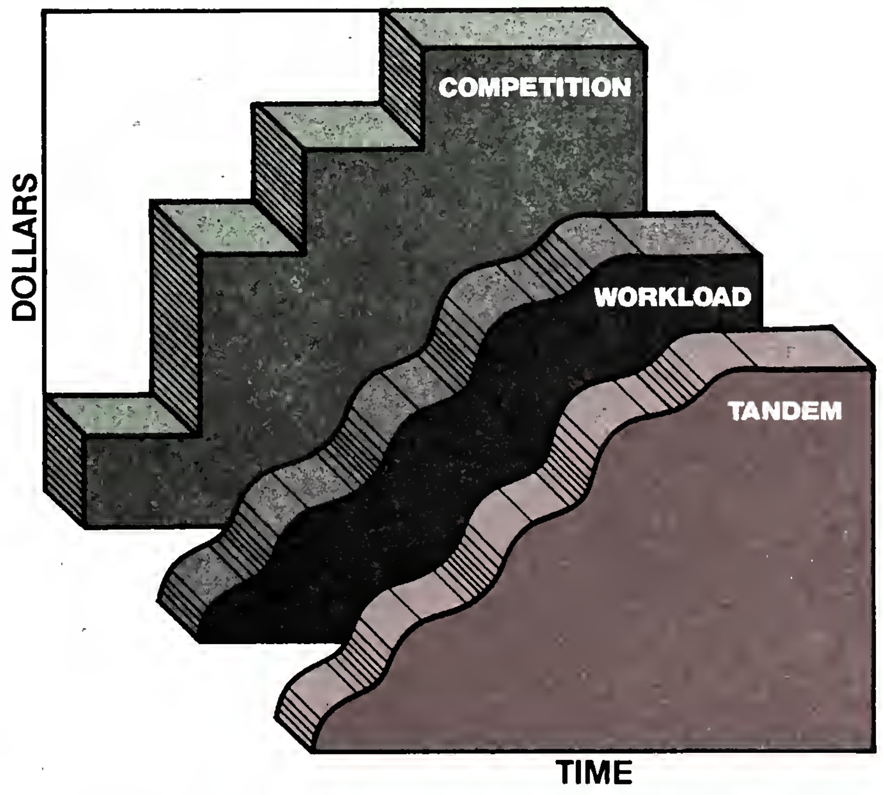

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TANDEMCOMPUTERS

Canaan Computer offers links for IBM units

TRUMBULL, Conn. — Canaan Computer Corp. has introduced two communications software products that link IBM Personal Computers to Canaan's DCS 5400 departmental computers, and IBM Personal Computers to mainframes running VM/CMS via the Canaan DCS 5400.

Multigate-VM is a gateway between the IBM Personal Computer and the IBM mainframe running VM, a spokesman said. It permits the exchange of IBM's PC-DOS and VM/CMS files between two Canaan DCS 5400 minicomputers or from the DCS 5400 to an IBM mainframe running VM. The program works with IBM's Remote Spooling Communications Subsystem facility and is free to Canaan DCS 5400 users. Multigate-PC consists of the PC Server and Canaan Server programs. PC Server redefines the use of the keyboard and function keys when the Personal Computer is connected to the Canaan DCS 5400. The PC Server includes capabilities for moving between a PC-DOS application and multiple VM/CMS sessions.

Canaan Server provides PC-DOS file transfer facilities to and from a Personal Computer. PC-DOS files stored on a DCS 5400 are treated as CMS files. The product also allows users to share files with other DCS 5400 users, according to the vendor. Multigate-PC is priced at $1,195.

Canaan Computer is located at 39 Lindeman Drive, Trumbull, Conn. 06611.

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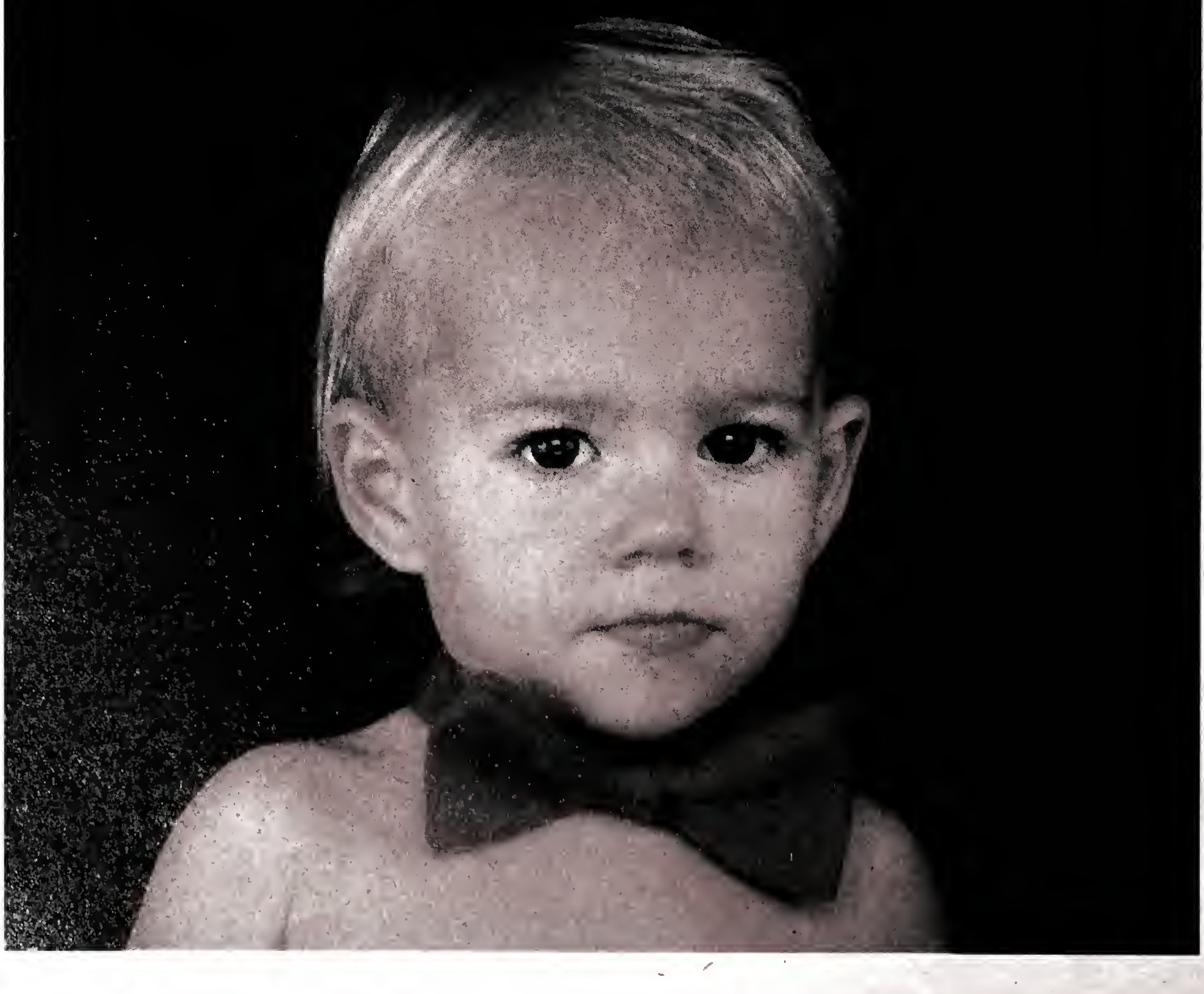

DCA adds binary link for Irma

NORCROSS, Ga. — Digital Communications Associates, Inc. has introduced communications software that facilitates the transfer of text and binary files between IBM mainframes and microcomputers equipped with the company's Irma board in an IBM 3270 communications network.

Irmalink FT/CMS supports mainframes under VM/CMS and the IBM Personal Computer, Personal Computer XT, Personal Computer AT and compatibles running Microsoft Corp.'s MS-DOS 2.0 or IBM's PC-DOS 2.0 or higher.

The product can handle both text and binary files and can support sequential and partitioned data sets with fixed and variable record formats, a spokesman said. Users can create and store custom transfer definitions and can modify parameters, including the prefix of a qualified data set name on the host or the code table used to define character sets.

Micro users can initiate file transfers by entering the source file name and destination file name. Irmalink FT/CMS assigns the transfer definition, including the characteristics of the transfer based on the file name entered.

Irmalink FT/CMS is priced at $175.

Digital Communications Associates is located at 303 Technology Park, Norcross, Ga. 30092.

SYSTEMS SOFTWARE

■ **Triangle Software Co. has announced Release 5.0 of its JCLcheck systems utility for IBM mainframes under IBM's MVS, OS/VS, MVS/XA and VM/CMS operating systems.**

JCLcheck detects and diagnoses IBM JCL errors before a program is submitted for test or production runs, a spokesman said. Release 5.0 enhancements include an online interface to IBM's ISPF; and support for IBM's Print Services Facility JCL control statements and Uccel, Inc.'s UCC7 scheduling software.

JCLcheck is priced at $17,825.

Triangle Software, Suite 275, 4340 Stevens Creek Blvd., San Jose, Calif.

■ **Pansophic Systems, Inc. has announced an enhanced version of its EZ/Key language-directed prompter/editor. EZ/Key Version 2.2 runs under IBM's DOS and OS operating systems and is designed to aid in the on-**

SOFTWARE & SERVICES

line development of Pansophic's Easytrieve Plus programs.

Version 2.2 enhancements include the addition of a utility password for IBM CICS users and support of the CICS Dynamic Transaction Backout facility. Version 2.2 is also said to feature as much as a 50% reduction in core requirements and improved response time.

EZ/Key Version 2.2 is priced at $9,000 for OS environments and $15,000 for DOS.

Pansophic Systems, 709 Enterprise Drive, Oak Brook, Ill. 60521.

■ **Hewlett-Packard Co. has announced terminal emulation software that allows its HP 9000 Series 200 supermicrocomputers to act as interactive, asynchronous, alphanumeric terminals to mainframes and minicomputers manufactured by Digital Equipment Corp., Data General Corp., Control Data Corp. and Prime Computer, Inc., among others.**

According to a spokesman, the HP 2392A and DEC VT100 terminal emulator, the HP 98791B, replace HP's asynchronous terminal emulator, the HP 2622A terminal emulator and the VT100 and HP 2622A terminal emulator.

The HP 98791B emulator reportedly is intended to ease host processor workloads by off-loading tasks to the Series 200 workstation. The HP 2392A and VT100 terminal emulator software provide access to host peripherals, files and time-sharing systems; transfers Ascii format files between the host and the Series 200; and allows a user to run programs designed for HP 2392A and VT100 terminals.

HP 98791B terminal emulation software is priced at $500.

HP, 3000 Hanover St., Palo Alto, Calif. 94304.

■ **GT Software, Inc. has introduced a Help screen and menu processor facility for applications running under IBM's DOS/VSE, OS/VS1 and MVS/XA operating systems with IBM's CICS.**

According to a spokesman, Assist/GT consists of three components: Tutor/GT; Menu/GT; and DOCM/GT. Tutor/GT can be used to add Help screens and tutorials to existing CICS-based applications without changes to source code. Menu/GT allows the user to add menus as front ends to existing applications, and DOCM/GT can be used to produce hard-copy documentation and system overviews.

Licenses for Assist/GT range from $2,500 to $6,500.

GT Software, 4411 E. Jones Bridge Road, Norcross, Ga. 30092.

■ **Consumer Systems Corp. has announced enhancements to its JCL Flow Documentation Package for IBM's OS and DOS operating systems. JCL Flow is an applications documentation system providing graphics system flow charts, cross-reference reports and information management capabilities.**

Enhancements in JCL Flow/OS Release 2.3 include an IBM IMS interface, a Xerox Corp. 9700 laser printer character set and commands to aid in retrieval, reformatting and control of input.

A permanent license for Release 2.3 of JCL Flow/OS costs $8,250; the DOS version costs $7,500.

Consumer Systems, 1100 31st St., Downers Grove, Ill. 60515.

■ **Oregon Software, Inc. has released its Pascal-2 compiler for Digital Equipment Corp.'s Ultrix-32 version of AT&T's Unix operating system.**

Pascal-2 conforms to the International Standards Organization's (ISO) Pascal standard (ISO 7185) and supports features including packed data structures and set types of up to 256 elements. The compiler allows calls to compiled routines written in Pascal, C or Fortran. Ultrix-32 is a version of the University of California at Berkeley's 4.2 BSD Unix that supports virtual memory and demand paging.

Pascal-2 for VAX/Ultrix machines costs $4,500.

Oregon Software, 6915 S.W. Macadam Ave., Portland, Ore. 97219.

■ **California Software, Inc. has announced Rescue/MVS, an on-line hardware reliability system that captures, analyzes and displays IBM system failure data.**

A spokesman said Rescue/

Continued on page 59

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**Computerworld, August 20, 1984*

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Continued from page 57

MVS immediately notifies operations personnel of a system failure, allowing them to take remedial action to limit the impact of the failure. One or more consoles can be used as monitors that display temporary and permanent system failures in real time across a network. The product pinpoints the sources of failure, analyzes problems, correlates groups of problems and identifies whether the unit or media is the cause of failure.

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Rescue/MVS begins at $15,000.

California Software, 3232 Nebraska Ave., Santa Monica, Calif. 90404.

■ **VM Software, Inc. has announced a sort/merge utility for IBM mainframes under VM/CMS.**

A spokesman said Vmsort rearranges data in a user-defined sequence. Users can sort records of either fixed or variable length. The Vmsort utility can be invoked as a terminal command or from a PL/I, Cobol or assembler user program. I/O data may reside on any device supported by CMS. The control statements used to invoke Vmsort are compatible with OS and DOS.

The permanent license fee for Vmsort is $5,000.

VM Software, Suite 355, 2070 Chain Bridge Road, Vienna, Va. 22180.

■ **Computer Systems Development, Inc. (CSD) has announced the SMC Basic interpreter for Digital Equipment Corp. VAX processors under VMS version 3.7 or later.**

The product was developed jointly by CSD and Science Management Corp. The SMC Basic interpretive language allows for use of files under DEC's Record Management System. RMS files may be defined within a program, and a program may have up to 29 files open at once.

Other features of SMC Basic are systems directives for on-line execution of Digital Command Language procedures or programs written in other languages, explicit and implicit precision control, elimination of rounding errors in business math and automatic conversion of numeric data types.

Prices for SMC Basic range from $2,795 on a Microvax I to $7,795 on the VAX 8600.

CSD, Suite 160, 300 Ellinwood Way, Pleasant Hill, Calif. 94523.

■ **Chicago-Soft, Ltd. has introduced a network performance monitor for IBM's MVS/SP Version 1.3, MVS/XA and Vtam Versions 1.3, 2.1 and 2.2.**

Netspy reportedly provides response time and traffic statistics per terminal and application. It also provides three levels of response time for the host and the network. The product displays response times and traffic statistics from an IBM Network Communications Control Facility 3270 screen or IBM's TSO command processor and provides System Maintenance Facility records for batch reporting.

Netspy is licensed for $6,250 for the first CPU.

Chicago-Soft, Suite 2, 738 B. LaSalle St., Chicago, Ill. 60610.

■ **Southern Systems, Inc. has announced the MPMF forms generation package for use with its Mercurion 1 nonimpact printer on IBM mainframes under OS/VS1, OS/VS2, VM, DOS/VS and DOS/VSE.**

A spokesman said the forms generation software defines font selection for form text and data insertions, boxes, lines, shading and language and text on forms. Input records are presented in 80-col. format.

Features of MPMF include reverse video and blank support for text and the ability to compress characters in a space. MPMF is priced at $5,000.

Southern Systems, 100 Belcher Road, Clearwater, Fla. 33515.

■ **Amalgamated Software of North America, Inc. has announced Release II of its IBM RPG-III compiler for the IBM System/34 and System/36 minicomputers.**

A spokesman said Release II makes the structured programming facilities of RPG-III available to IBM RPG-II users on the System/34 and System/36. Programming commands supported by Release II include DO, DO-WHILE, DO-UNTIL, IF/THEN/ELSE, COMPARE-AND-BRANCH and CASE. The RPG-III compiler supports disk file operations such as READ PREVIOUS, OPEN and CLOSE and UPDAT.

The Release II compiler costs $600.

Amalgamated Software of North America, P.O. Box 6610, Malibu, Calif. 90265.

■ **Information Processing Techniques Corp. has introduced a C language applications development tool for programmers developing software for Motorola, Inc. 68000 microprocessor-based machines.**

A spokesman said C68 runs on Data General Corp. computers under Rdos, AOS, AOS/VS and Information Processing's AT&T Unix-based Eclix operating systems. It is also available for Digital Equipment Corp. computers running DEC's VMS or Ultrix. The product includes a cross-compiler

Continued on page 60

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Continued from page 59

that generates 68000 code from C source code and a cross-assembler that produces relocatable binary files that can be linked through C68's linking loader. C68 also includes a librarian facility for the linking loader. C68 is priced at $7,000.

Information Processing Techniques, 1096 E. Meadow Circle, Palo Alto, Calif. 94304.

■ **Software Development Systems, Inc. has announced Version 3.0 of its Uniware Software Development System for AT&T Unix operating systems.**

A spokesman said the enhanced version includes an absolute-listing generator that produces listings for absolute addresses and linked object code. Other enhancements include a link editor, an object module librarian, a symbol name lister and an address map utility. The package supports multiple overlays, arbitrary length symbol names and unlimited symbol capacity.

Uniware 3.0 is priced at $2,000 for Motorola, Inc. 68000 microprocessor- and Unix-based machines.

Software Development Systems, 3110 Woodcreek Drive, Downers Grove, Ill. 60515.

■ **Executive Support Products, Inc. has announced the Extended Printer Queueing (XPQ) facility for use on Honeywell, Inc. processors under Honeywell's Gcos 8 and Gcos 3 operating systems. The product extends the capabilities of the company's Remote Printer Queueing (RPQ) product.**

XPQ reportedly enables users to direct printing jobs to an available printer. XPQ can support a maximum of 600 remote printers as opposed to the nine printers RPQ supports. XPQ will queue print requests until the printer is available. XPQ also provides a batch-interfacing capability to allow reports produced in batch to be directly routed to printers assigned to the XPQ system.

A permanent license for XPQ costs $8,900 per CPU.

Executive Support Products, Suite 211, 3901 MacArthur Blvd., Newport Beach, Calif. 92660.

■ **Systar Corp. has announced File/34-38, a package that reportedly facilitates file transfers between IBM Personal Computers and IBM System/34, 36 and 38 minicomputers through public data and packet-switching networks.**

File/34-38 is designed to run with Systar's Gateway 34/38 front-end communications package and communicate through Systar's PC Elf IBM 3101 terminal emulation program. It reportedly interactively stores or retrieves files from the minis and contains an error-checking protocol for data transmission to the micro.

The product is priced at $750 as an enhancement to Systar's Gateway 34/38 and PC Elf programs.

Systar, 1762 Technology Drive, San Jose, Calif. 95110.

■ **Virtual Microsystems, Inc. has announced Version 3.0 of its Bridge/86 software that allows users of Digital Equipment Corp. VAX minicomputers to run Microsoft Corp.'s MS-DOS.**

Version 3.0 reportedly provides support for the Decnet network, disk caching, mounting and unmounting of floppy disks of up to 8M bytes during processing and on-line Help screens. Decnet support allows the MS-DOS user to access a remote VAX, according to a spokesman.

Version 3.0 of the Bridge/86 is priced at $7,500.

Virtual Microsystems, Suite 300, 2150 Shattuck Ave., Berkeley, Calif. 94704.

■ **Value Software, Inc. has announced Release 2.0 of Vsdispatch, its report distribution package for IBM's MVS operating system.**

The product now supports Xerox Corp.'s 9700 printers, according to a Value Software spokesman. Other enhancements include processing options for reports, capabilities for producing shipping labels and expanded IBM System Management Facility records.

Vsdispatch is priced at $32,000.

Value Software, 498 North Kings Highway, Cherry Hill, N.J. 08034.

■ **Unidot, Inc. has announced a family of software tools to run on AT&T's Unix systems, including cross-compilers, macro assemblers and other development tools.**

A spokesman said the products are targeted to microprocessors from Intel Corp., Zilog, Inc. and National Semiconductor Corp. The macro assemblers produce the appropriate assembler code for the target microprocessor. The Unidot assemblers support a flexible macro facility and conditional assembly facility. They also support up to 255 separately relocatable object sections, a full assembly listing, symbolic debugging and a symbolic cross-reference listing.

All the macro assemblers use mnemonics compatible with the microprocessor's operating code mnemonics and assembly language syntax. For development of code in a higher level language, Unidot offers several C cross-compilers. Unidot's C cross-compilers for a variety of microprocessors accept all current Unix extensions and the full C language, and the code produced may be put into read-only memory.

Prices for the products vary with the host processors but range from $600 to $4,000.

Unidot, 602 Park Point Drive, Golden, Colo. 80401.

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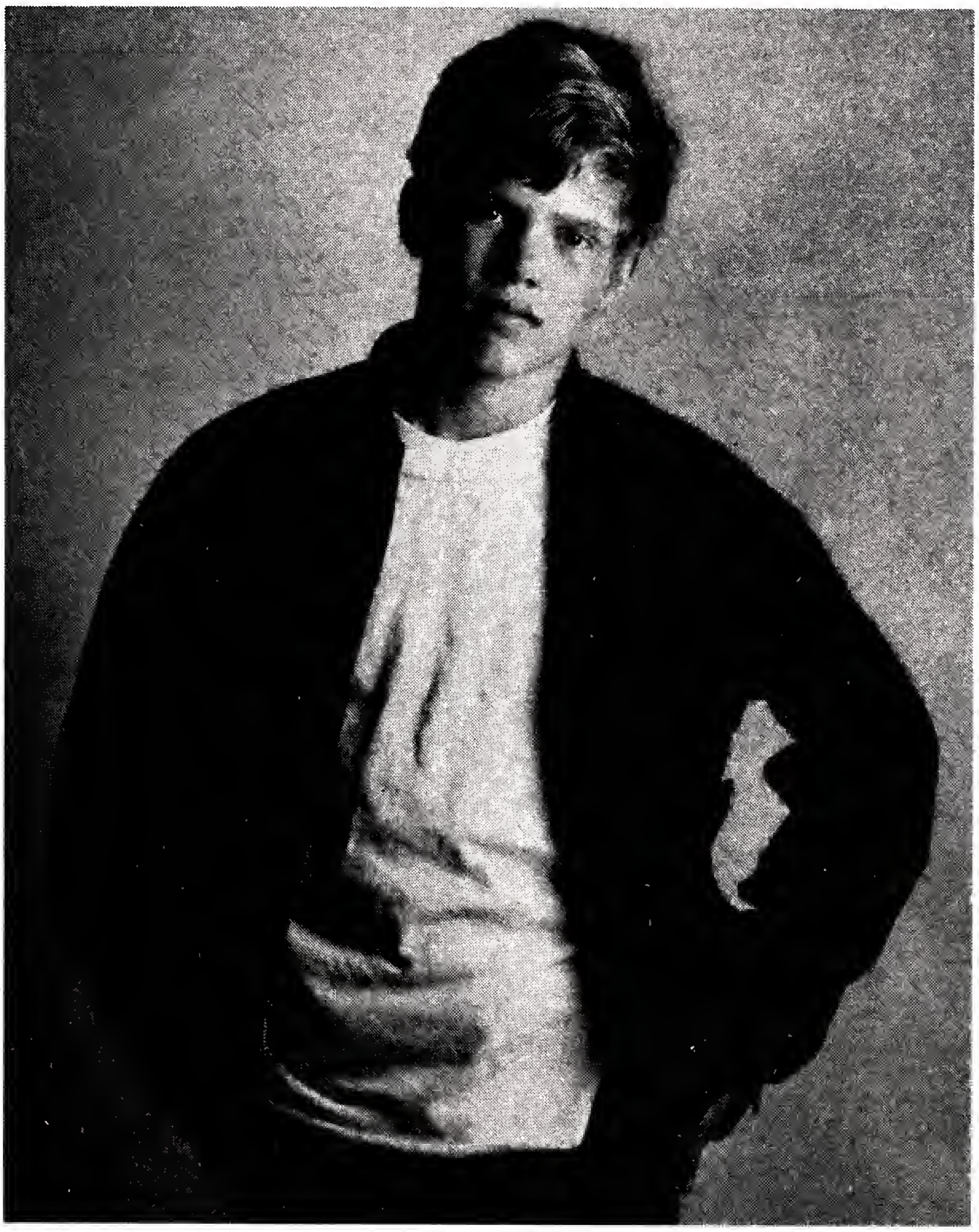

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SOFTWARE & SERVICES

APPLICATION PACKAGES

■ **STSC, Inc. has announced Version 5.5 of Dataport, its data analysis package for IBM mainframes under VM. The company also introduced a Dataport interface to Integrated Software Systems Corp.'s (Issco) Tell-A-Graf graphics package.**

Version 5.5 is said to include an added RUN command and a merge feature that allows users to merge tables by creating new rows, columns or pages. Dataport provides graphics, spreadsheet-like analytical functions and data interfacing capabilities. It supports analysis of spreadsheet-like tables with a range of mathematical, financial and statistical functions.

Dataport's Tell-A-Graf interface provides full screen "pick-and-point" menus to allow users to select options for line, bar, pie and text charts. Dataport automatically generates Tell-A-Graf command and data files to produce the desired graph.

Datapoint costs $14,000. The Tell-A-Graf interface costs $4,000.

STSC, 2115 E. Jefferson St., Rockville, Md. 20852.

■ **Distribution Management Systems, Inc. has announced the DMS-1000/IBM Distribution System for order processing, inventory management, invoicing and purchasing. The system runs on IBM 4300 and 3030 series mainframes under OS/MVS.**

A spokesman said DMS-1000 allows orders to be entered on-line either locally or on a remote dial-up basis. As each order is entered, the system validates customer and product codes, prices each line item, checks and commits inventory, assigns a shipment warehouse and performs a credit check of a customer's account.

The inventory management module tracks and updates inventory and reports products whose net inventory levels fall below reorder points. Reports generated include stock status reports by warehouse and combined totals for multiple warehouses.

DMS-1000/IBM Distribution System costs $170,000.

Distribution Management Systems, 81 Hartwell Ave., Lexington, Mass. 02173.

■ **The Wheatley Group, Ltd. has announced Version 3.0 of Wheatley Insurance Systems (Wins), an interactive data base management system (DBMS) for property and casualty insurance companies and managing general agents. Wins runs on the IBM System/38.**

A spokesman said Version 3.0 of Wins supports a number of personal, commercial and specialty lines of insurance and is intended to simplify file processing, document handling and lengthy printing. It also includes enhancements to the claims processing, policy management and accounting modules.

The revised claims application modules are integrated with the policy management and accounting modules using a relational DBMS. Data and applications security is provided through password and data file restrictions. Audit trails of transaction activity are maintained automatically.

The starting license fee for Wins is $150,000.

The Wheatley Group, One Huntington Quadrangle, Melville, N.Y. 11747.

■ **Tower Systems International has announced Release 5.3 of its Omnicalc spreadsheet for IBM mainframes under VM/CMS and MVS/TSO.**

Included in the enhanced release are a menu prompting facility for spreadsheet commands and an improved command structure, a spokesman said. Release 5.3 of Omnicalc provides capabilities for multiple windowing and three-dimensional modeling, a spreadsheet formula audit facility, an external program link and on-line help files.

Release 5.3 carries a license fee of $300 per month.

Tower Systems International, 19782 MacArthur Blvd., Irvine, Calif. 92715.

■ **Uccel Corp. has announced Version 5.0 of its Commercial Loans Manager, a component of the company's Infopoint integrated banking system for IBM DOS and OS environments.**

Commercial Loans Manager processes commercial lending arrangements such as notes, commitments, participations and indirect liabilities, a spokesman said. Expanded processing capabilities reportedly include calculations for Rule of 78s, pro rata and sum-of-the-balance functions. Clients can define charging methodologies for each institution and tailor the methodologies, according to the vendor.

The price of the Commerical Loans Manager ranges from $82,000 to $98,000.

Uccel, Uccel Tower, Exchange Park, Dallas, Texas 75235.

■ **Management Science America, Inc. has added a case mix management module to its Health Care Sys-**

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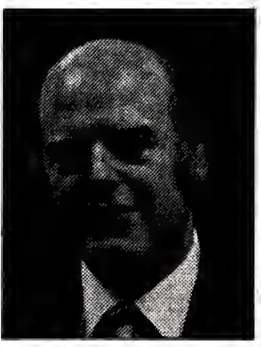

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INVENTORY MANAGEMENT (1:00 PM - 3:30 PM)

4/9	Seattle, WA	4/24	Chicago, IL
4/16	Los Angeles, CA	5/14	Indianapolis, IN
4/18	New York, NY		

DISTRIBUTION REQUIREMENTS PLANNING
(8:30 AM - 3:30 PM)

4/2	Dallas, TX	5/15	Detroit, MI
4/16	Cleveland, OH	5/16	Boston, MA
4/24	Montreal, Quebec	5/29	Greensboro, NC
5/7	Philadelphia, PA		

CUSTOMER ORDER PROCESSING
(8:30 AM -12:00 Noon)/
ACCOUNTS RECEIVABLE (1:00 PM - 3:30 PM)

4/25	Atlanta, GA	5/22	Toronto, Ontario
5/8	Chicago, IL	5/30	San Francisco, CA

FIXED ASSET ACCOUNTING/CONTINUING PROPERTY RECORDS (8:30 AM - 12:00 Noon)

4/12	Philadelphia, PA	5/9	Atlanta, GA
5/7	Chicago, IL	5/23	New York, NY

PURCHASING & MATERIALS MANAGEMENT
(8:30 AM - 12:00 Noon) /
ACCOUNTS PAYABLE & PROCUREMENT MATCHING (1:00 PM - 3:30 PM)

4/3	Dallas, TX	5/8	Philadelphia, PA
4/9	San Francisco, CA	5/14	Boston, MA
4/11	Philadelphia, PA	5/15	Indianapolis, IN
4/17	Cleveland, OH	5/16	Detroit, MI
4/23	Charlotte, NC	5/23	Salt Lake City, UT
4/25	Montreal, Quebec	5/30	Greensboro, NC
4/25	Detroit, MI		

MANUFACTURING RESOURCE PLANNING
(8:30 AM - 3:30 PM)

4/4	Dallas, TX	5/14	Detroit, MI
4/10	San Francisco, CA	5/15	Boston, MA
4/18	Cleveland, OH	5/16	Indianapolis, IN
5/9	Chicago, IL	5/23	Toronto, Ontario
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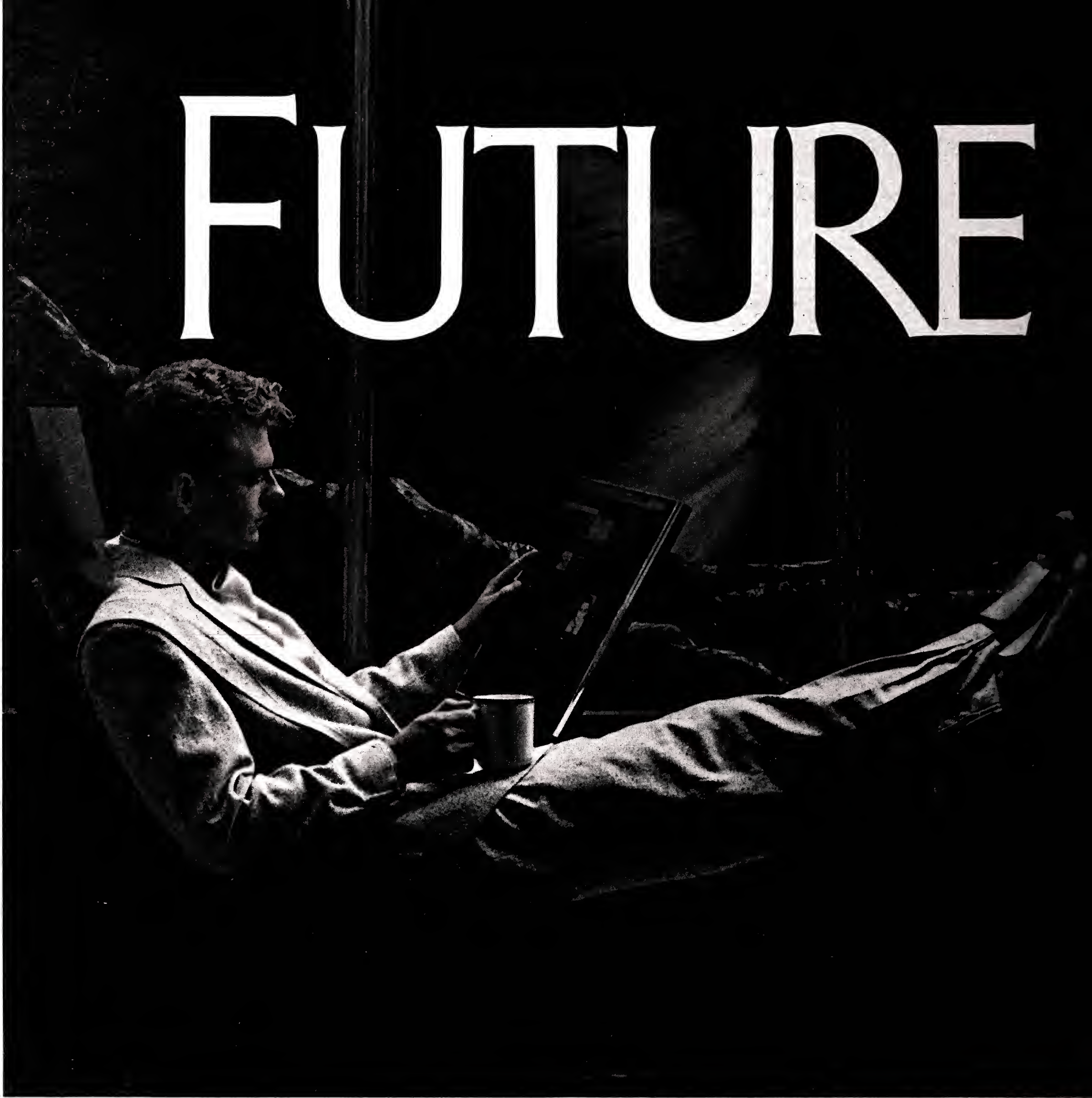

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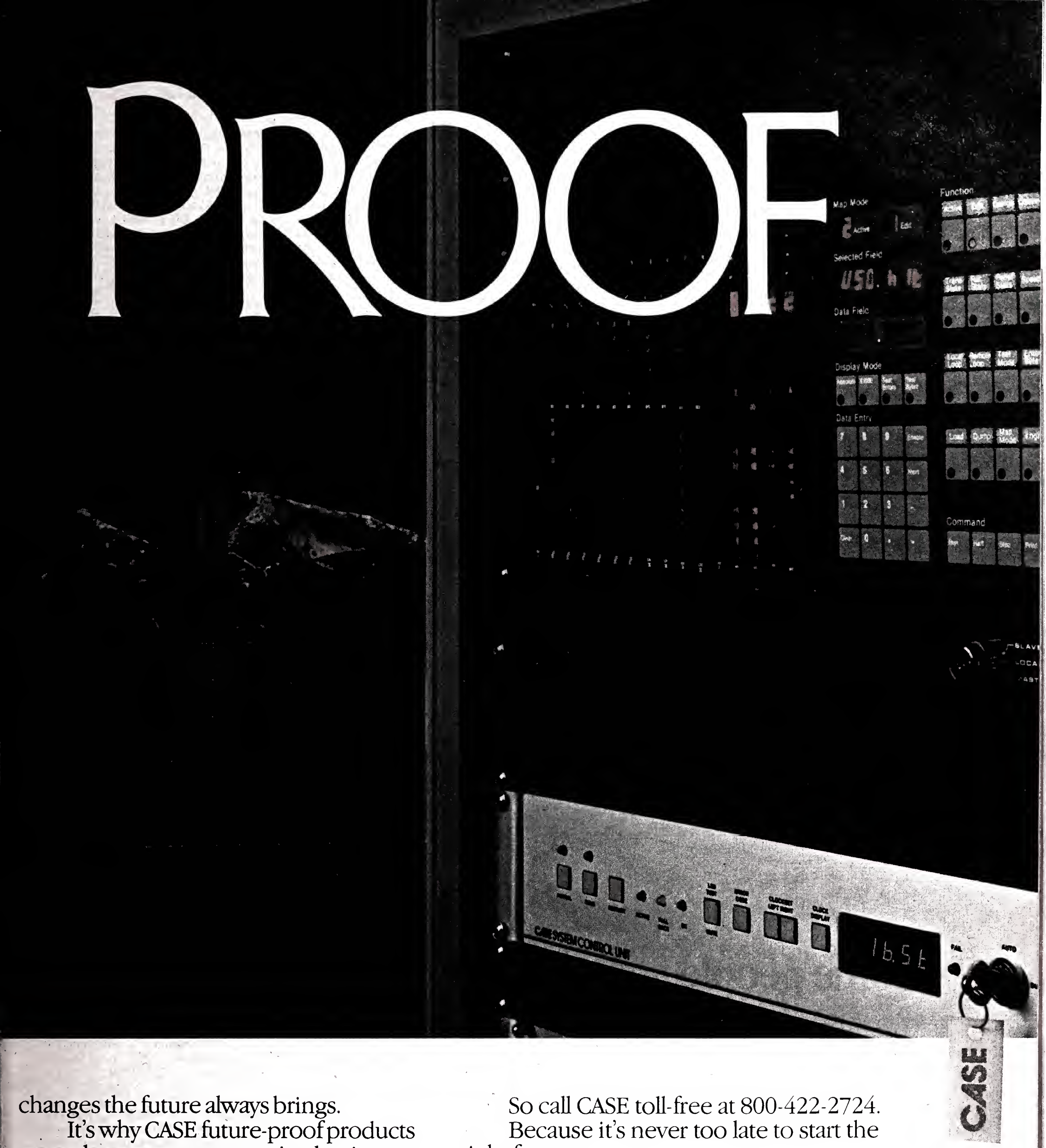

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SOFTWARE & SERVICES

Continued from page 62

tem for IBM mainframes running the DOS, OS and MVS operating systems.

A spokesman said the Marketing, Clinical and Financial Information System includes capabilities for forecasting service demand, managing multiple product lines and supporting third-party billing.

The Health Care System is priced from $150,000 to $225,000.

Management Science America, 3445 Peachtree Road, Atlanta, Ga. 30326.

■ **Sigma Consulting Group has introduced Worksmart, a maintenance management package for Hewlett-Packard Co. HP 3000 systems.**

Worksmart is a modular system for facility and equipment maintenance that is based on a data base management system. Worksmart reportedly provides facilities for maintaining equipment records and history, scheduling preventive maintenance, work order processing, storeroom and purchase order control and cost and management information reporting.

The base price for Worksmart is $30,000.

Sigma Consulting Group, Suite 104, 12465 Lewis St., Garden Grove, Calif. 92640.

■ **Administrative Technology, Inc. has announced an investment portfolio performance auditing system for Data General Corp. minicomputers under DG's AOS, AOS/VS and Rdos operating systems.**

A spokesman said the Investment Portfolio Performance Audit System (Ippas) was written in Cobol and can be ported to other operating systems supporting that language. The product facilitates the analysis of investment income by relating income to original and current values, calculating unrealized yield to cost and market and relating each instrument and group of instruments to total portfolio value and income.

Audit trails track transactions for portfolios managed by a number of dealers.

Ippas is priced at $10,000.

Administrative Technology, 35 W. 35th St., New York, N.Y. 10001.

■ **J.C. Silvestri Associates, Ltd. has introduced an investment management system for IBM System/34 and System/36 mainframes.**

Designed for government agencies and municipalities, the Maxback package enables investment portfolio managers to monitor investment performance. Decision-support tools and a variety of standard reports are included in the package, a spokesman said.

Maxback is licensed for $4,900.

J.C. Silvestri Associates, 134 W. Lake St., Addison, Ill. 60101.

■ **American Management Systems, Inc. has announced that its Computer-Assisted Collection System (Cacs), designed to aid in the collection of delinquent credit card and loan accounts, is now available for Tandem Computers, Inc.'s Nonstop II and Nonstop TXP CPUs.**

A spokesman said Cacs provides on-line access to current accounting, collection and employee performance data. Cacs monitors all accounts and schedules collection work according to user-defined criteria.

Cacs is also available for IBM mainframes and Wang Laboratories, Inc. processors. The Nonstop version of Cacs is priced from $125,000 to $150,000. The IBM version is priced from $150,000 to $170,000, and the Wang version starts at $65,000.

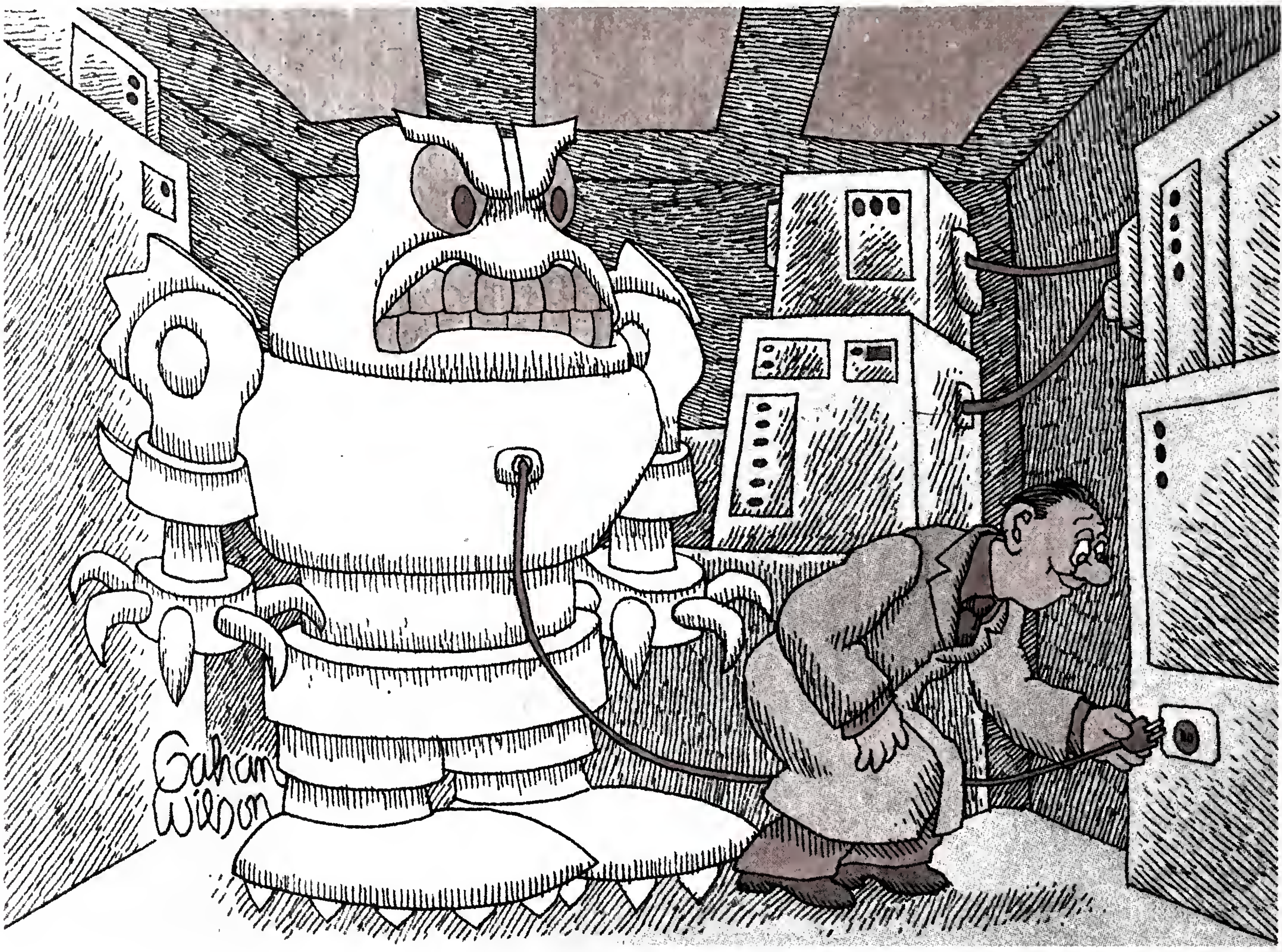
American Management Systems, 1777 N. Kent St., Arlington, Va. 22209.

■ **User-defined function keys and an optional security system are among the enhancements to Release 3 of MCBA, Inc.'s accounting and distribution system for Texas Instruments, Inc.'s Business Systems minicomputers.**

Designed to operate under TI's DX10 operating system, packages include accounts payable and receivable and general ledger. It is said to permit programs and data to be stored on selected disks or directories and includes enhancements that permit integration with MCBA manufacturing packages.

Release 3 packages are priced from $2,000 to $4,500.

MCBA, 2441 Honolulu Ave., Montrose, Calif. 91020.



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JCLCHECK software catches all JCL errors and provides complete, on-line JCL validation and concise error diagnostics. Plus complete documentation on a job stream or entire production system suitable for insertion in the run book. And it can operate under TSO, TONE, ROSCOE or CMS.

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Over 400 DP departments now use JCLCHECK software to correct the errors of their ways, and save money at the same time.

To put it in another perspective, we'll send a sales representative out to analyze *your* operation and provide a written statement on exactly how much time and money you're spending on JCL errors. And how much you could be saving with the JCLCHECK package.

Still, some people are destined to find these things out the hard way.

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Yes, I want to stop living dangerously.
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If you don't ask for us, you could be asking for trouble.

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■ **Information Processing Techniques Corp. has introduced Version 4.13 of its Exhibit presentation graphics package.**

A spokesman said Exhibit runs on Digital Equipment Corp. superminicomputers under DEC's VMS or Ultrix operating systems and Data General Corp. superminis under DG's AOS/VS, AOS or Rdos.

Exhibit also runs on Information Processing Technique's AT&T Unix-based Eclix operating system.

Enhancements to Exhibit include the ability to enter up to 1,000 data points, the ability to use plotters or printers and support for solid-fill graphics capabilities, according to the company spokesman.

License fees for Exhibit range from $2,700 to $7,500, depending on host system.

Information Processing Techniques, 1096 E. Meadow Circle, Palo Alto, Calif. 94304.

■ **Digital Equipment Corp. has announced that Manufacturing and Consulting Services' Anvil-3000D two-dimensional drafting system is now available for the DEC Vaxstation I workstation.**

A spokesman said the Anvil-3000D is a drafting package subset of Manufacturing and Consulting's Anvil-4000 design package, which runs on DEC VAX processors.

Anvil-3000D capabilities include geometric construction and manipulation, display control, drafting with user control of dimensions and notes and data management.

The drafting system also features a proprietary algorithm for hidden line removal. This feature allows users to simulate a three-dimensional model.

Anvil-3000D is priced at $8,750.

DEC, 2 Iron Way, Marlboro, Mass. 01752.

■ **Integral Systems, Inc. has announced Human Resource Management Software (HRMS) for the IBM System/38 that contains payroll, personnel management and data security packages.**

HRMS was previously available only for IBM mainframes.

A spokesman said the personnel and payroll modules are integrated and can also be used in stand-alone mode.

The data security system protects all applications modules, controlling access to the individual employee and data element level.

HRMS/38 features on-line, menu-driven processing and a field-by-field, on-line Help facility.

Prices for HRMS/38 modules begin at $35,000.

Integral Systems, 165 Lennon Lane, Walnut Creek, Calif. 94598.

■ **STSC, Inc. has announced Version 2.2 of Trucks, its fleet management system for IBM's VM/CMS and MVS/TSO.**

Trucks 2.2 includes an enhanced system for generating truck routes, added user commands and five additional reports, a company spokesman said.

The enhanced routing system sequences routes and provides capabilities for shifting orders between routes to improve order consolidation.

Added reports reportedly include the following: driver trip sheets; loading manifest; driver manifest; dispatch summary; and trip directions report.

Trucks 2.2 is priced at $175,000.

STSC, 2115 E. Jefferson St., Rockville, Md. 20852.

■ **Fusion Products International has announced Version 2.0 of its Fusion/36 Management Information Center, a data retrieval package for IBM System/36 minicomputers.**

A spokesman said Version 2.0 adds functions that include logical join, a personal computer interface and several output options to the report generator.

The addition of logical join allows users to perform sort and select operations on any of the retrieved fields, including those selected from files other than the primary file.

Fusion/36 is also capable of creating interchange files in Ascii, Ebcdic or Software Arts, Inc.'s Data Interchange Format, allowing data transfer to a microcomputer for use with Lotus Development Corp.'s 1-2-3 and other micro software packages.

Version 2.0 of Fusion/36 is priced at $3,600.

Fusion Products International, Suite 295, 900 Larkspur L.C., Larkspur, Calif. 94939.

■ **Environmental Systems Research Institute has announced Revision 3.0 of its Arc/Info software for managing geographic information by creating a data base with graphics map displays. Arc/Info runs on processors from Prime Computer, Inc., Digital Equipment Corp., Data General Corp. and IBM under VM/CMS.**

A spokesman said Revision 3.0 includes a Map Library supplement that uses a spatial tilting system to manage multilayered geographic data bases.

A user reportedly can extract data from Map Library by specifying a geographic area and a set of layers.

The system automatically extracts the selected layers, clips each layer by geographic window, joins the clipped tiles into a full map, handles and corrects map sheet overlap and edge-match and loads the data into specified user work space, the vender said.

Revision 3.0 of Arc/Info costs $75,000.

Environmental Systems Research Institute, 380 New York St., Redland, Calif. 92373.

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And, since security is a concern with any mainframe access system, pcMAINFRAME offers four levels of protection: rigid internal protocols, user IDs and passwords, data "profiles" controlled by the Systems Administrator, and a transmission log showing each request by type, PC ID, date, time, number of records transferred and error messages.

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VENDORS

from page 51

majority of software vendors, and they can exercise substantially more marketing clout.

Those assets were pointed out in a recent International Data Corp. (IDC) report entitled "Third-Party Software Strategies of the U.S. Hardware Manufacturers."

According to the Framingham, Mass.-based market research firm, "Software vendors have their share of problems. . . . They, too, face the enormous burden of software development headaches. Not only that; marketing costs are astronomical and usually preclude their dealing with anything but a limited geographical base. They often lack credibility because of their small size and limited user base, preventing further the kind of industry penetration they need for continued profitability in the face of escalating costs and user demands."

Massive investment required

Hardware vendors, too, especially those experiencing financial hard times, are pressed by the massive investment required to maintain existing software, let alone the huge sums necessary to develop new systems. Users want far more in the way of software than hardware-oriented companies — including even the giant blue vendor — can hope to supply.

The long lead time involved in bringing, say, a cross-industry application to market also weighs heavily on hardware vendors. Why should users wait for such a system to be delivered from their hardware supplier when they can purchase a similar one from a software company with no delay? In fact, the end user may even opt for another vendor's hardware if it runs the desired third-party software.

Thus, IDC stated, "What appears from the dilemmas of the two groups is a rare synergy between the requirements of the hardware industry and those of the software industry. Hardware vendors, which require software to move their products, in turn provide marketing strength and lend legitimacy to smaller software companies. Hardware vendors that lack the resources and contacts to reach smaller accounts can rely on regional software companies that have long-standing relationships with local user communities to reach them."

What's the likely outcome of that synergy? You guessed it — deals. These deals include software marketing arrangements and product, even company, acquisitions.

According to IDC, that fact is not lost on computer vendors. The months since early 1983 have seen "intense activity among hardware manufacturers seeking to persuade third-party vendors to write software for systems in all size classes," the report contended.

Future for third-party software?

What does the future hold? "IDC feels this activity will continue with ever-increasing intensity in the next few years. Hardware vendors have seen what a tremendous sales tool third-party software can be. Additionally, third parties have proven themselves to be an important channel of distribution which will prove critical in the highly competitive atmosphere of the late 1980s."

That is good news for users. Although it has been quite some time since users had to rely solely on their hardware supplier for software, in the future they will have a veritable smorgasbord of software spread before them.

As hardware costs continue to fall, computer vendors will have to become more attuned to the software needs of their clients to stay in the game. That kind of attention can only bode well for users. The symbiotic relationships that will spring up between the hardware and software vendors, each hoping to maintain its place in the history of the industry, promise to offer users some interesting opportunities in the near future.

EXPERT

from page 51

can provide a good basis for going on to develop major systems." Large-scale expert systems supporting production processes, asset management and new products design, for example, are often "difficult and slow to implement," the report said.

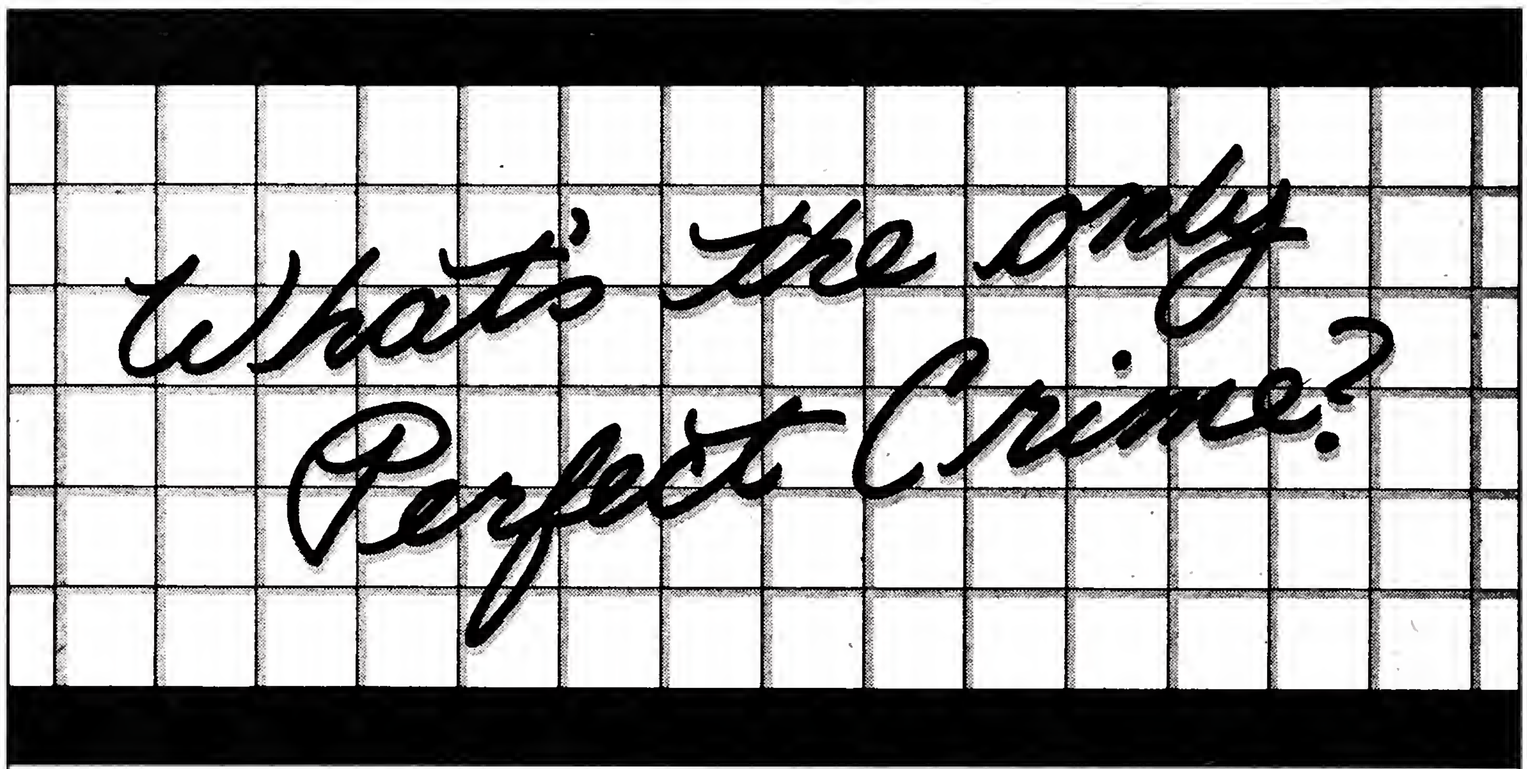
"Small systems may well have more practical impact and market significance than larger ones — at least in the short run," the Ovum report noted.

The environments that offer the most favorable prospects for expert systems continue to be the larger, wealthier and more rapidly growing industries that have taken to computerization. Those groups, the report maintained, will continue to account for a large share of the expert systems market.

The Ovum report predicted more than 1,000 small commercial expert systems will be available in the U.S. by 1988. Marketing strategies will be an important factor in the success of vendors selling expert systems, the report noted, adding "If some of the small systems are well chosen and packaged for mass markets, they could become widely used, while the promoters of major systems are still struggling to prove their value and get them accepted."

The role of research foundations and systems houses in the development of expert systems is on the decline, the report noted. Knowledge engineers once employed by these foundations have started their own firms.

The report is available for $395 from International Planning Information, 164 Pecora Way, Portola Valley, Calif. 94025.


What's the only Perfect Crime?

IT'S WHEN NO ONE KNOWS THERE'S BEEN ONE. Computer crime is 10 times more profitable than robbing a bank. That's a fact. But, this statistic is only available on KNOWN computer crime...it's impossible to know how much monetary and informational theft goes undetected; some of it, perhaps, from your own system. The ability to access computers via dial-up ports is beneficial, but it creates a potential exposure akin to leaving the vault door unlocked. Disgruntled employees, strikers, malicious hackers and dishonest competitors can obtain information, vandalize the system, even misappropriate inventory...all from a push-button phone.

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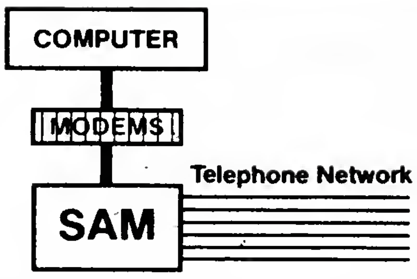

SAM also:
- Interfaces with any modem, any speed, any protocol.
- Provides audit trail including unauthorized access attempts.
- Has simultaneous multi-call handling capability.
- Is modular for both port and call-back directory capability.
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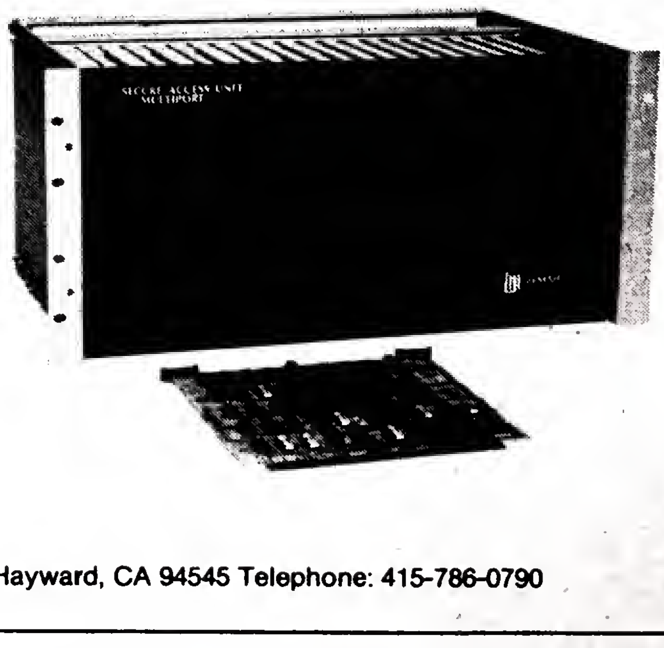

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“What’ll they think of first?”

Lotus® and Cullinet are working together for the first time.

They’re working on a new micro-to-mainframe link that will help personal computers communicate with mainframe computers. A link that will allow Symphony™ from Lotus to tie directly into Cullinet’s Information Center Management System (ICMS).

Lotus and Cullinet.

When the two leading innovators in software development put their minds together, the only question left is—“what will they think of next?”

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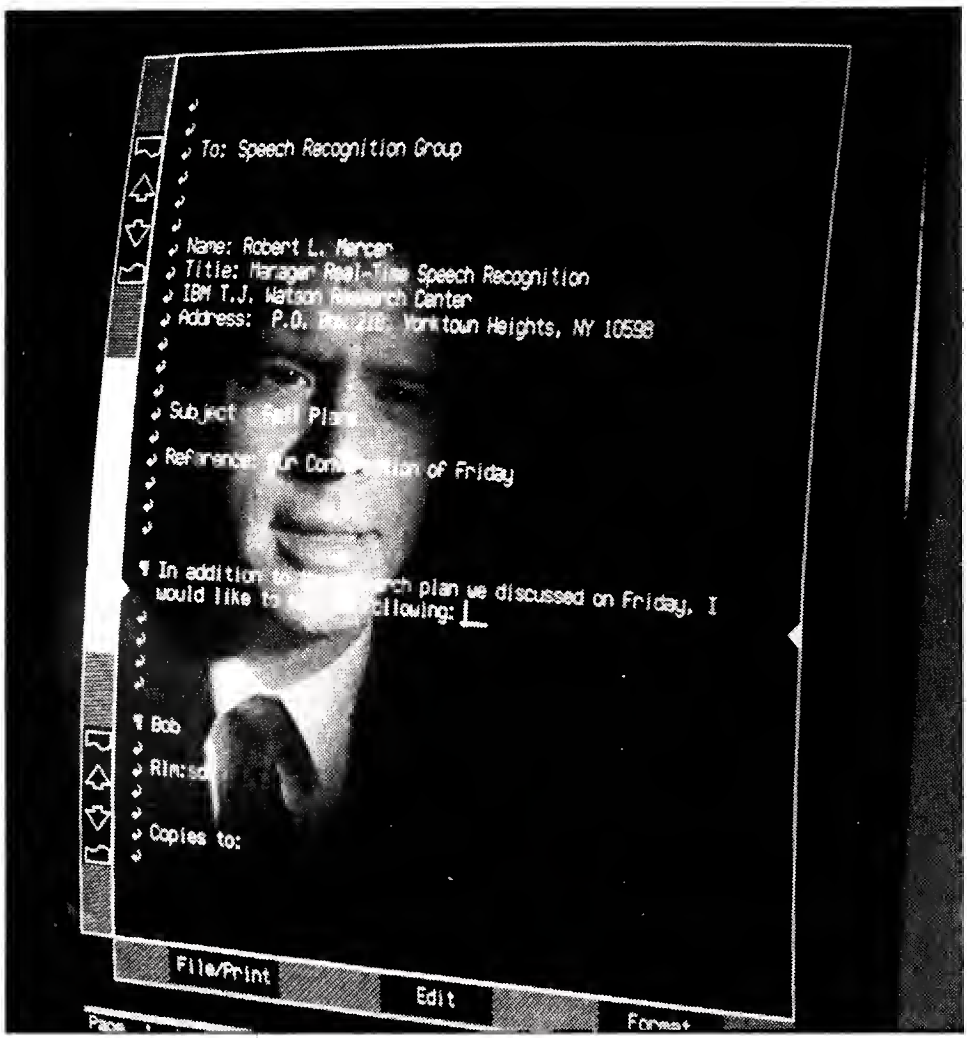
Thomas J. Watson Research



To: Speech Recognition Group

Name: Robert L. Mercer
Title: Manager Real-Time Speech Recognition
IBM T.J. Watson Research Center
Address: P.O. Box 218, Yorktown Heights, NY 10598

Subject: [illegible] Plan

Reference: Our Conversation of Friday

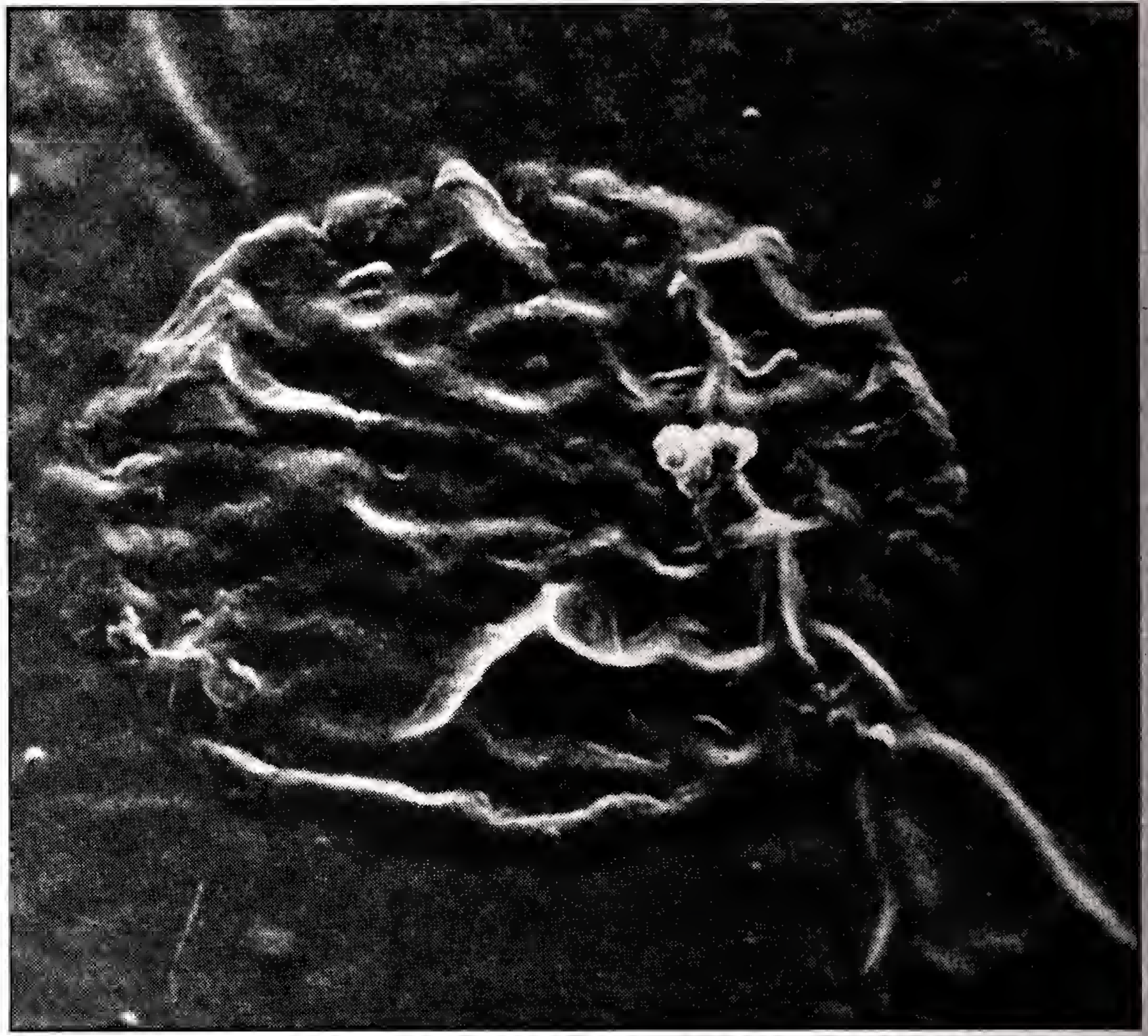
In addition to [illegible] research plan we discussed on Friday, I would like to [illegible] following:

Bob

Rlm:sd

Copies to:

An experimental speech recognition system allows the creation of office documents, such as letters or memos, by voice. Words spoken from a 5,000-word business vocabulary are displayed as text on the screen.



The first X-ray image of live human blood platelets was accomplished by IBM scientist Ralph Feder. A novel X-ray method combined with techniques borrowed from computer chip manufacturing produced this first view of a blood platelet's structure.

For the sake of IBM

By George Harrar

> *"If you look at the world of very small objects, you find there is no science there."*
> — Praveen Chaudhari

YORKTOWN HEIGHTS, N.Y. — The computer industry is pushing against the limits of the known.

At IBM's Thomas J. Watson Research Center, that means:

■ Generating the shortest light pulses ever — 12 femtoseconds (quadrillionths of a second).

■ Creating a speech recognition system that translates voice into screen text from a 5,000-word vocabulary, with 95% accuracy.

■ Capturing the first X-ray image of live human blood platelets.

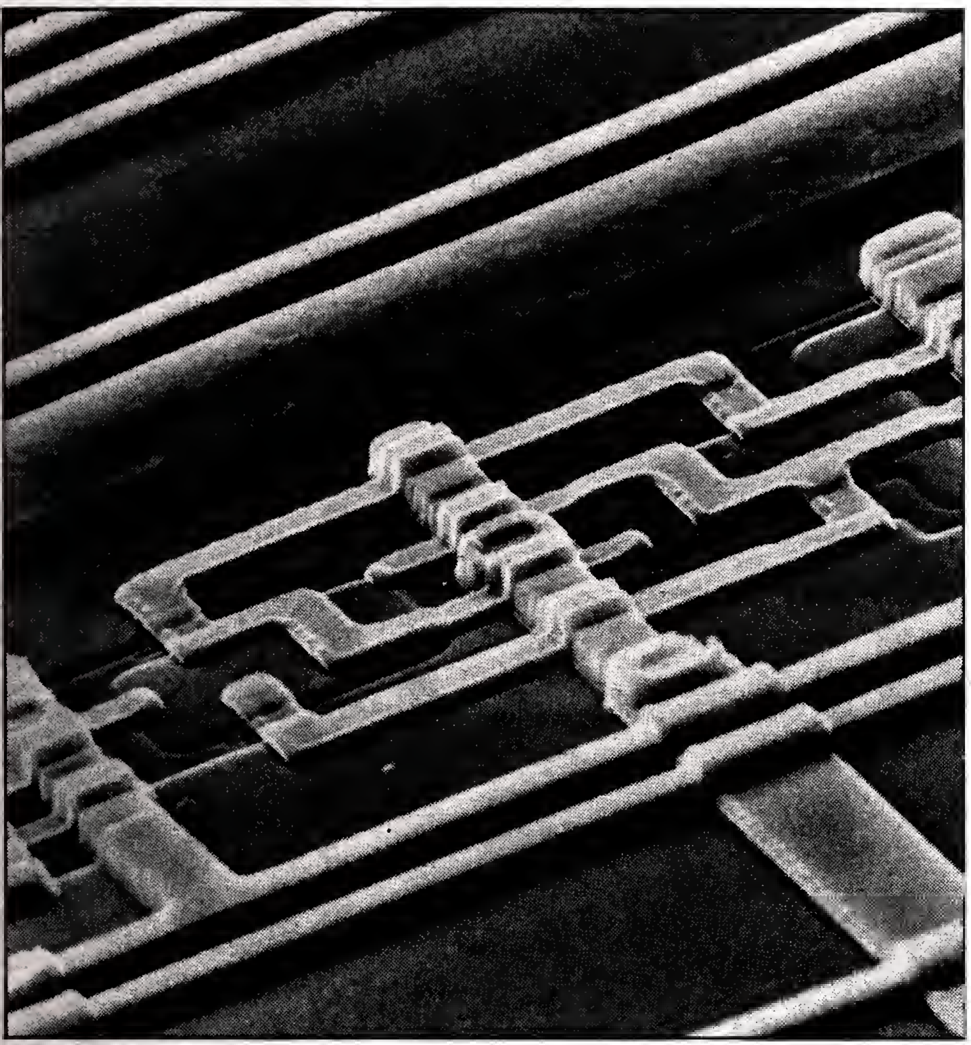
■ Building an expert system (YES/MVS) to monitor and control a mainframe's operating system through real-time, interactive operation.

■ Developing an experimental 64K-bit memory chip that works at speeds of 16 to 20 nanoseconds (billionths of a second).

These achievements of the last year or so at Yorktown Heights illustrate the research division's dual function: to explore technologies that eventually may be integrated into IBM products (speech recognition, YES/MVS, the 64K-bit chip) and to advance science (light pulses and X-ray imaging) regardless of whether the research applies to IBM products.

"The goal is a research division famous for its science and technology and vital to IBM." This encapsulation of Yorktown Heights' mission appears in a small glass sphere for visitors to see. Leon Cookman, director of administration, says: "We labored over the word 'famous.' We decided, what the hell, we would use it because it means what we want, and that is a research organization that is world class."

Center



Composed of six layers on the chip surface, the self-timed sense amplifier, magnified here several thousand times, detects information stored on the high-speed 64K-bit chip.

and science

IBM, master of marketing, rarely hears the name "master of technology." The computer giant is hobbled by its own success. Whatever it sells it sells by the million. Innovation must prove itself not just in terms of performance but also in manufacturing. A good idea at IBM must be manufacturable a million times over.

Over the years, the research division, which includes the Yorktown Heights headquarters as well as San Jose and Zurich branches, developed:

- The thin film head, which makes the advanced disk systems of IBM possible.
- The relational data base concept, based on pioneering work by Edgar Codd.
- The high-end robot that IBM currently markets along with the accompanying robot control language, AML.
- Fortran, the first high-level programming language to be accepted widely.
- The single device memory cell, on which all of IBM's main memories are based.

The new challenges are submicron.

"Why is it," asks Praveen Chaudhari, vice-president of Science, "we can't make a thousand-angstrom device? We sell several-micron devices. What's to prevent us from building a half-micron device and manufacturing and selling it? It's just that we don't know how to control processing and materials. There is nothing fundamental in nature that says you can't."

There are no rules of science showing how you can, either. The industry is passing into the submicron world of matter where there is no experience as teacher.

The industry has extracted, Chaudhari says, almost all

Inside. . . .

1. Speech recognition with a slight pause

Fred Jelinek tackles "To be or not to be" and other quirks of speech. Don't ask when this system will be a working part of your office — IBM doesn't know. ID/8.

2. An expert system for MVS operators

The system as computer operator, experimentally — at least for now — on a 3081 mainframe. ID/10.

3. Why they said no to Josephson

Money wasn't the reason IBM scrapped Josephson, say John Armstrong and others who made the decision. And they get a little angry if you suggest it was. ID/12.

4. Silicon: Is IBM up to something?

Silicon bipolar is the choice for high-speed computers, but IBM is pushing MOS to its limits as well. ID/13.

5. A systems manager in a systems house

Allan Weis, director of Computing Systems, supports a demanding research clientele. Imagine if your end users knew as much as his do — and let you know it. ID/16.

the knowledge there is about how to build computer devices. "We don't know how things behave when they get that small. I know how this table is behaving, but if I take a quarter or a tenth of a micron of that, its properties are going to be different than in bulk form. How do you make sure that when you deposit atoms on a given substrate they come down in the arrangement you want? How do you make sure that the right kinds of atoms got there?"

The development and manufacturing of semiconductor VLSI [very large-scale integration] devices still involve a large element of empiricism, according to John Armstrong, vice-president, Logic and Memory. "Every time you go from 256 to 512 [K bits] or every time you take a step of factor two in density, you get a new set of problems. You might well say, 'You should have silicon processing licked by now. You've been doing it for 15 years — anybody ought to be able to do it.' The fact is, anybody can do it, if you want to practice last year's technology."

Armstrong suggests a way to distinguish among all the manufacturers a customer can choose from when buying a computer system: "Ask the vendor how it really works at the level of the atoms and molecules." IBM can buy a considerable understanding of computers at this molecular level with its $4.2 billion annual expenditures on research and development companywide.

For instance, how does reactive ion etching work? "Why is it that if you have a glow discharge in a certain rarified atmosphere of gases, it etches silicon selectively and not oxide or another gas?" Armstrong asks. "What determines the tolerance you have on the process? To answer those questions requires an understanding of atomic physics, surface chemistry and plasma physics and chemistry.

"You can't understand everything on a scientific basis. But it is very important to understand key features that may bite you in development and manufacturing. If you don't really understand it, you don't really know how to control your tools."

■

One-tenth of IBM's 370,000 employees work in 26 development labs, 14 science centers and three research labs worldwide. The research labs, headquartered in the semicircular building at Yorktown Heights, form a division employing 2,800.

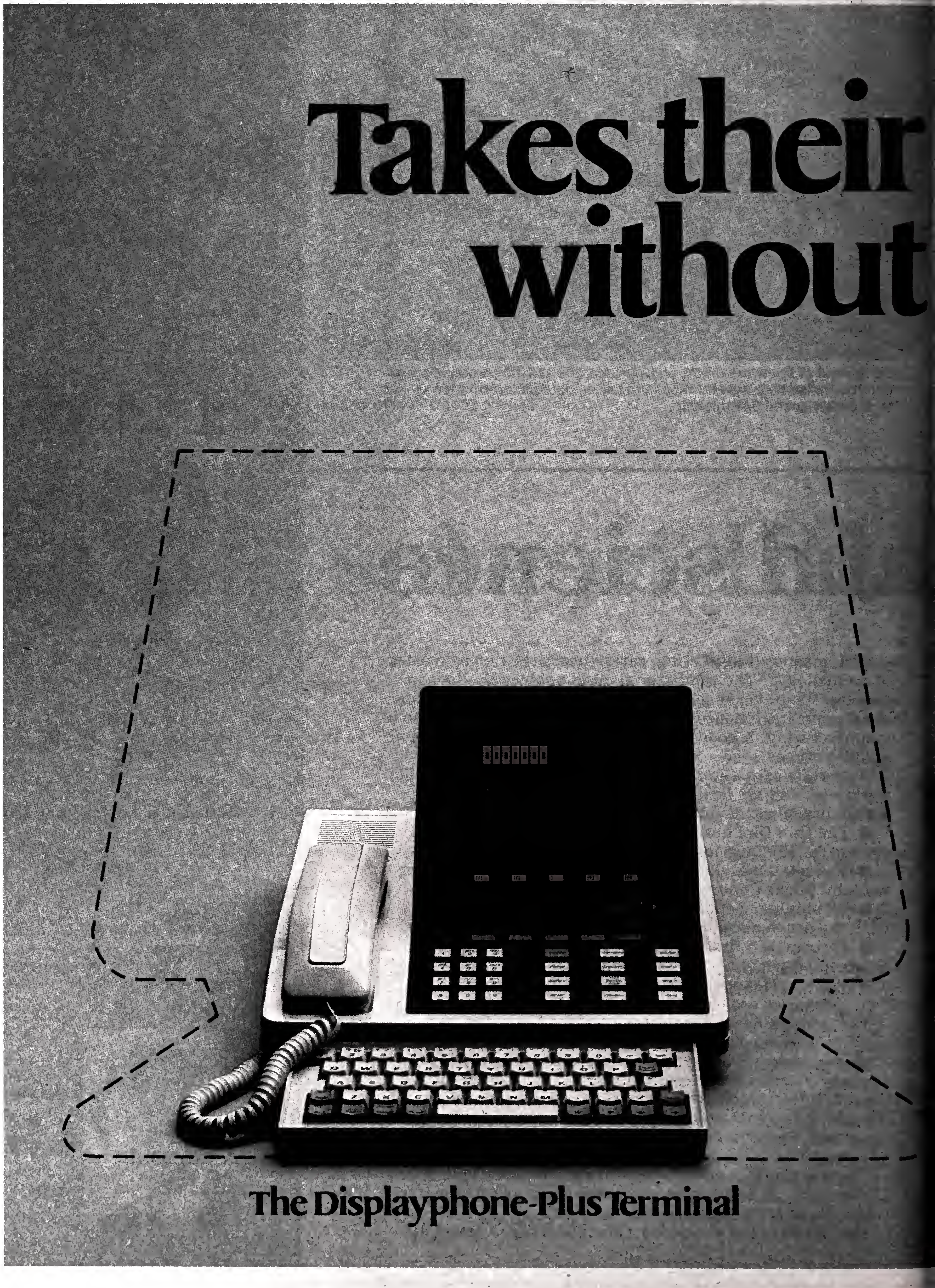
Thomas J. Watson Jr., who dedicated the research center in his father's name 24 years ago, told *Computerworld* in a June 13, 1983 interview: "We built laboratories in attractive places — the West Coast, Yorktown, Zurich and near Cannes, overlooking the Riviera — simply to get people to come and work for IBM. Belief in R&D is probably 35% of why we became successful."

Today, the director of the research division, Senior Vice-President Ralph Gomory, reports to Chairman of the Board John Opel directly — not through any product group. This line to the top gives Yorktown Heights the independence to choose its own areas of research rather than always responding to the demands of the product groups.

The researchers are reminded often that they do not work far from the very practical, corporate needs of Armonk. Cookman, the director of administration, says: "We tell [them] they have a responsibility for technology transfer. What it means is that when your research work has gotten to a point where you have a result you think is useful, it's your job to go out in IBM and make that work known and do your best to see it gets used somewhere. In the early days, we, like a lot of research organizations, felt that if you did great work and sort of threw it over the transom, somebody would find it and yell 'Eureka!' and take off with it."

The Watson Research Center divides its efforts under the "Science" and "Advanced Projects" headings. Advanced projects might be called applied science elsewhere. Science at Yorktown Heights is indistinguishable from that practiced at major research universities. Science is the underpinning of knowledge for the research division and corporation as a whole. As Cookman says, "We never want to let this science base erode."

Computer science in general lacks the fundamental laws that describe and



govern other fields, such as physics. IBM is searching for the laws that specify limits so that when, as Armstrong says, "you start to design new and better architectures, you will know whether there is 2% left that you can gain, or whether you are 98% there and a fundamental law says you can't get any better."

Surfaces and interfaces draw considerable attention in the science area. "You still have unanswered scientific problems in bulk materials like ceramics," Cookman says. "I believe we are the world's largest electronic user of ceramics. In the 3080 series, there is a multilayered ceramics package which is about a dozen layers of ceramic sheets which then have to be fired and controlled. When we got into that manufacturing problem a few years back, we found out that one didn't understand enough about the basic science of ceramics. There was just not enough fundamental information available to the world. So we have built a science team in ceramics."

Most research follows IBM's natural field of interest — anything that might conceivably need to be known to make business computing machines. But as scientists get close to discovering anything — computer-related or not — they don't like being told to redirect their energies to more corporately rewarding areas. If the research division thinks it can make a contribution to the world of science rather than to the world of IBM, one or two researchers will be spun off for a while to see what they can come up with.

So alongside the logic and memory, storage, I/O and non-von Neumann architecture research going on here, one finds the pursuit of the magnetic monopole, for example.

"Theory says you can have a single magnetic pole," Cookman says. "No one has ever detected one, and we don't know whether there are 10 in the universe or 100 or 1,000. But since we have done a lot of work in superconductivity and had made some of the most sensitive magnetic field detectors, we decided to enter that search.

"We are also trying in an eloquent way to measure the mass of a neutrino. And one researcher who is an M.D. is using a computer to model epileptic seizures — the way neurons fire and finally all get in phase and you get one huge burst which is an epileptic seizure."

Daniel Grischkowsky's "Ultrafast Science With Lasers" team generated history's shortest light pulses in November — 12 femtoseconds. Ultrashort pulses can be used as a strobe light to slow or freeze the apparent motion of molecules, atoms and electrons.

Physicists inside IBM — Ralph Feder, Veronica Banton and David Sayre — joined with medical researchers outside the corporation to develop flash X-ray microscopy. The technique, first demonstrated early this year, allows high-magnification photographs of a blood cell's structure while the cell is alive.

Closer to IBM's vested interests is artificial intelligence research, such as YES/MVS (Yorktown Expert System for MVS operators). This experimental in-house system was designed to manage a complex computer facility with minimal intervention of an operator.

Speech recognition often falls under the "artificial intelligence" heading, but IBM avoids that label. Last October the Watson Research Center announced an experimental system whose aim is continuous speech recognition in real time. But the "continuous" part of the goal appeared to be so difficult to attain that IBM modified its expectations.

Cookman says, "In the last year, the director of research asked the [speech recognition] group what it could do if it accepted one small constraint, and that is, asking the speaker to pause slightly between each word as he speaks."

What the group showed it could do was develop a system with a business vocabulary of 5,000 words that is individually speaker-trained (to account for accents) and 96% accurate. An identification program examines the context of words to distinguish, for instance, among homonyms such as "to," "too" or "two."

The spoken word "period" can indicate time or punctuation, as in, "I would like to see the sales report for the third period — period." The IBM system prints one word

terminal's place
the space.

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> ”
>
> *We need to know the properties of metals, ceramics, plastics, polymers, composite materials, glasses. I can tell you where every one of these is used, and without the right properties, the device wouldn't work.*

Praveen Chaudhari

as a period and the other as a punctuation mark. This distinction is no trivial feat. The text being printed out on the screen slows to deal with "period — period" problems and then races to catch up, despite the fact that the calculations are done by three Floating Point Systems array processors and an IBM 4341.

The "slight pause" researchers built in to stop the natural elision between words keeps this system in the realm of experiment and out of any office application soon.

"We wanted to show that you can do it," Cookman says. "The first thing people ask is, 'When will I have one for my PC?' That is like turning to the Wright brothers and saying, 'OK, it flew, where is the drink cart?' "

For technology transfer to work, the Watson Center researchers must carry their work far enough along to be able to offer the development labs a tested, known quantity. Still, the unexpected happens.

"Before we announced our 3080 series," Chaudhari remembers, "we ran into difficulties in manufacturing. All the problems had been solved in Advanced Technology, but they [the 3080s] were out in manufacturing now. They began having yield problems. If you're going to make money, it is important to get your yield as high as you can. A bunch of us from the science department went to the divisions. Within a matter of months with their help, we solved their problems. The yields began to go up.

"You uncover these [problems] when you are really in a manufacturing mode and they're coming down the line. You suddenly realize that all that pilot line business where things are controlled better — it's not quite the same. It gets a little bit harder as you go down the stream."

Besides anticipating problems, researchers must realize that any small product improvement they come up with must fit into the greater scheme. Armstrong sums up the corporate line: "IBM sells systems. We don't sell chips, we don't sell packages — we sell systems. What's important is what makes the system best. If I figure out a way to make a chip that is 10 times faster than this, but I still have to have 400 or 500 chips and I put those 10-times better chips on the same package, I'm going to be lucky to get 10% improvement at the system level.

"Let's say you have 64K memory technology licked; now you're going to work on 256K memory chips. It is not just a question of scaling down the dimensions and getting better control over the process. You have to do that, but what you find is that there is a whole new set of things that can go wrong."

Watson Center researchers are concurrently working on MOS and bipolar technology, asking how these devices can work and be fabricated reliably when all the important

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Looking out from IBM's Yorktown Heights facility

dimensions are submicron.

Armstrong says, "How do you make a very, very thin layer of silicide on an MOS device, and how can you control the abruptness of the interface between the silicide contact and the silicon? The electrical properties of a Schottky Barrier are determined probably by a thickness of a material only a few atoms thick. The perfection and cleanliness of that very small region of space are reflected in the electrical properties. So it has been a constant source of research to understand how to control such a delicate structure in a manufacturing environment."

Getting an innovative chip through the rigors of manufacturing still doesn't ensure it will ever be used in an IBM system. "The 3080X has a 26- or 27-nanosecond cycle, or whatever," Armstrong says. "You ask, 'Why isn't it shorter? What are all the delays in there?' Well, the speed of the chip is less than one-half of what makes up the speed of the computer. More than half is due to packaging."

Chaudhari's Science group must understand the bottlenecks on the road to technological advances well enough to say, "Hey, that's a hopeless route, forget it," or "This is what you have to do to overcome it."

The Watson scientists spend considerable effort creating materials that don't exist normally in nature — materials deliberately structured for manufacturing and use in products. "In the semiconductor technology or electronics business," Chaudhari says, "you're going to do this with an unprecedented number of things that have never been tried before in the history of man. That's where the challenge is."

Throughout IBM product lines, whether printers or typewriters or CPUs, it's the material that typically stands in the way of performance improvements, and not just silicon. The challenge is first to understand how the material behaves and second to control its behavior during the manufacturing process.

"Most people think that in an electronics company, semiconductors would be the thing that people would be working on," Chaudhari says. "But in fact, semiconductors are just one material. We need to know the properties of metals, ceramics, plastics, polymers, composite materials, glasses. I can tell you where every one of these is used, and without having the right properties, the device wouldn't work."

Chaudhari graduated from MIT and joined IBM in 1966 as a research staff member — the general title for all new employees. "There are no exceptions," he says. "After they have shown us they can do good science, then we consider them for management."

Promotions to management are apparently not routine matters of longevity. "A good manager can do some good, but a bad manager can do an awful lot of harm," Chaudhari says. "It is a good thing to remember about managers. We don't want to hire anybody who would say yes to us. We want to hire someone who is likely to say 'Why?' "

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Turning speech into screen text

One of the more ambitious research projects now under way at the Watson Research Center is a prototype speech recognition system developed by Frederick Jelinek, senior manager of Continuous Speech Recognition. The result of 12 years' research, Jelinek's system currently incorporates a 5,000-word vocabulary.

The current test application for the system is a set of internal memos including examples from such top IBM executives as Frank Cary and John Opel. An operator reads the memos into a microphone, pausing briefly between each word, and a monitor displays the system's translation of the words.

A study in the ambiguities of spoken communication, the speech recognition system attempts to match words in its vocabulary with the sounds it receives from an operator. The system also attempts to adjust its interpretation to fit the context of the sentence.

One of Jelinek's favorite examples is Shakespeare's "To be or not to be," a phrase that causes particular difficulty for the system because it must determine whether the user means to, too or two and B, be or bee.

Jelinek was interviewed in Yorktown Heights by Tom Henkel, senior editor, systems.

How do you view your role in developing your speech recognition project into an IBM product?

I think I'm supposed to sell it to someone in some division. We have only had a real-time speech recognizer operating since July, so it may be too early. There are questions we haven't answered, such as "How robust is it?" and "How many people can use it?"

Right now, we are experimenting with people who are very much interested in making the recognizer work. In other words, we are using our friends. I'm not sure how the recognizer will work if it is used by someone who doesn't have a personal stake in making speech recognition work.

Before we can hand the project over to the product people, we are going to have to do what we call a robustness trial. We will take the speech recognizer to 50 different offices and record people who are not our friends and see how well it does for them.

Is working in such an experimental field a disadvantage when it comes to convincing IBM to develop speech recognition into a commercially available product?

I don't feel it is a handicap right now. I've been doing this for 12 years, and I'm pretty glad when they leave me alone. I would certainly like to see products made from the ideas we have generated here, there is no question about that. But at the same time, there are problems we haven't answered yet. Perhaps when we solve those problems, the case will be so overwhelming that the product development people will have to say, "We'll take it tomorrow."

Right now we have a functional prototype. I certainly would like to bring it to a good enough performance [level] so people could use it and get a feel for what it would be like to have one. But this research does not address any economic questions. For example, should it be provided for single users? Or should the capacity be distributed through terminals? After all, research shows that most executives dictate maybe two memos a day, and each memo takes about 20 minutes. So the rest of the time this speech recognition system would be idle. It is quite possible that it is uneconomic to develop it into a stand-alone product. Maybe it should be used in a network.

> ”
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> *We could not assemble any system, except for an enormous price, that could handle continuous speech recognition. So we took a step backward and decided to put pauses in between words.*

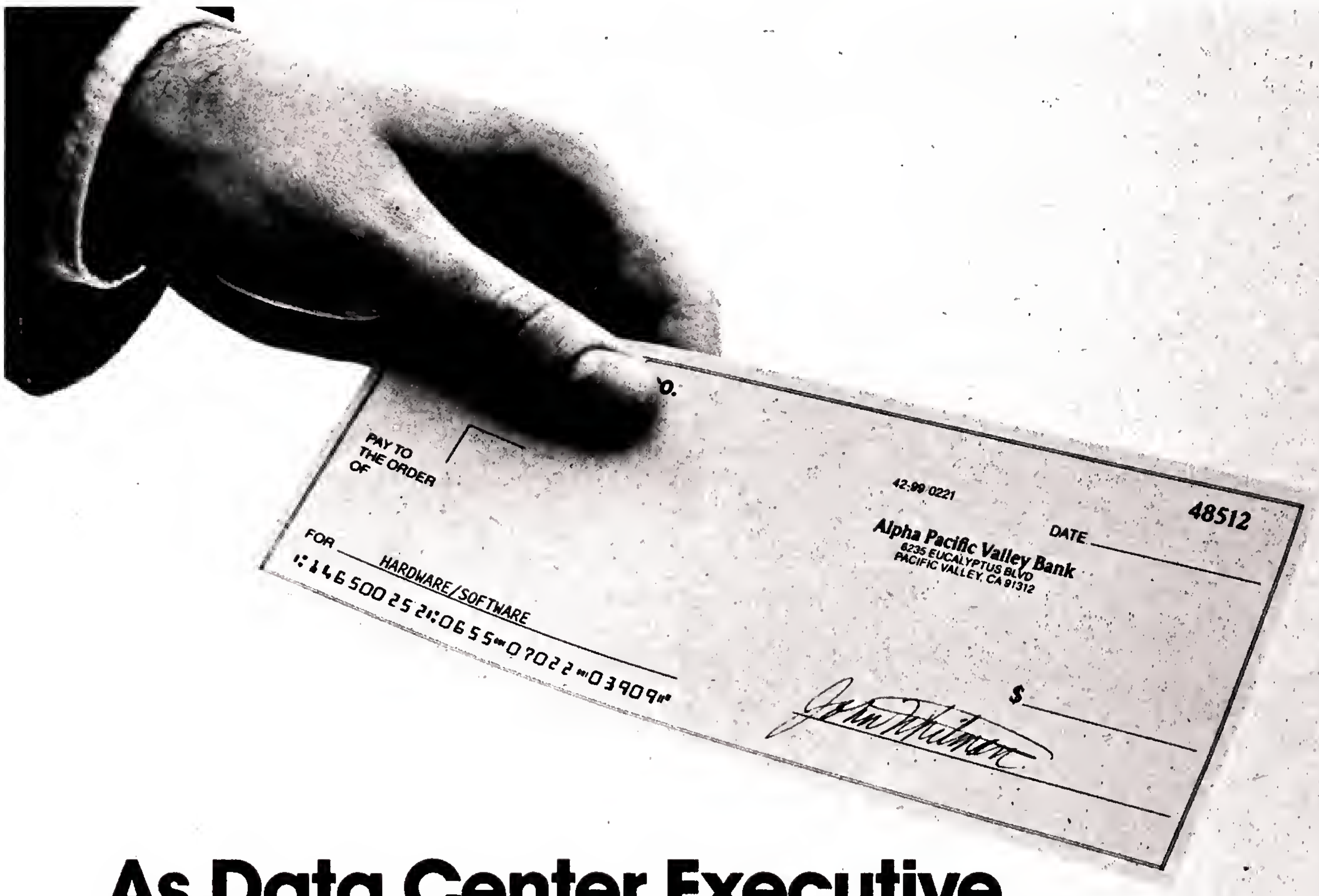
Do you have any responsibility in making those economic decisions?

No, how could I? I know nothing about marketing.

How has your research changed during the 12 years you have been working on this project?

We started out just recognizing digits. Then we added an artificial language. "Artificial" means there was a grammar, and if you did not say the words that made up a sentence in that grammar, then it wouldn't recogize them. The artificial language had a finite grammar of 250 words. Out of those 250 words, you could say about 14 million sentences. When you said a word (except for the word "the") and it was correctly recognized, the system knew exactly where you were in the grammar because the words were only in one spot. That was all continuous speech. Isolated speech came later.

The next step was to do something called laser patent text. We found that in Washington, D.C., they have descriptions of patents in the laser



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field. We thought that lawyers probably write similarly — I mean they are not concerned with original expression. Even though the sentences in the patents look complicated, they are very much alike. We saw this would be a good step to go into natural language, so we made a 1,000-word vocabulary.

None of this research was in real time, and we were using general-purpose computers. After about three years, we thought it was time to incorporate some human factors into our research and get some experience in real time. When we looked into real-time processing, it turned out that we could not assemble any system, except for an enormous price, that could handle continuous speech recognition. So we took a step backward and decided to put pauses in between words. That reduced the computational load by about a factor of six.

So we got our own 4341 and bought three Floating Point Systems array processors. We did not want to mix the errors we made in constructing special hardware with the errors we made constructing our algorithms. Also, we wanted to run this on a commercial, well-supported system — nothing homegrown. If we wanted continuous speech recognition, we would have to make the hardware ourselves.

How does the system work now?

The current application is to create text using voice. The application is for office memoranda. There is a terminal, a keyboard, a mouse and a microphone. The idea is that you dictate a memo and create text. Whatever errors you create, you correct them, then push a button and [the memo] is printed out. Right now, we do not have the system connected to an electronic mail system. But that is one thing we would like to achieve, because we suspect most people send mail electronically rather than on paper. So we must have this system hooked into an electronic mail system before it will be accepted as a product.

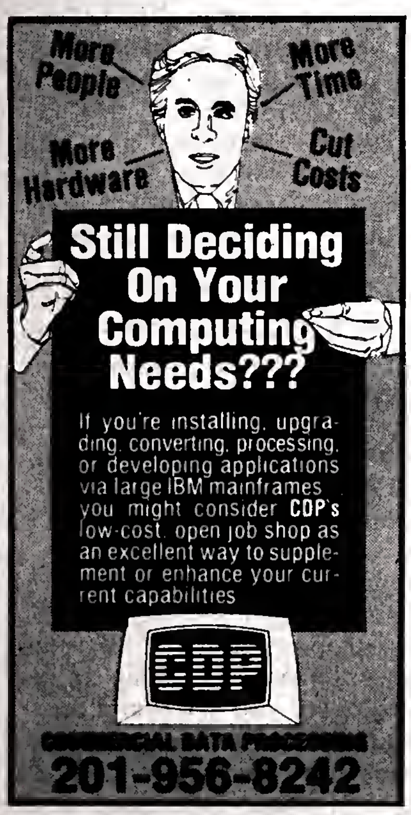
Currently, the system has a 5,000-word vocabulary. Of course, you can say anything you wish, but if it is not among those words, the system will make an error. We would like to enlarge the vocabulary to 20,000 words because our current estimates indicate 20,000 would be adequate for most applications. Right now, about 7% of the words you wish to say are not in the vocabulary.

This is a learned system?

You have to provide it with about 100 sentences, or about 1,000 words. That takes about 20 minutes. Sentences appear on a screen and you read them. That is the data the system uses to make a picture of your voice. Unfortunately, this step is currently on our mainline batch computer, so it takes maybe a day to process.

How many voices can the system recognize?

It's a matter of disk capacity. Right now, we have maybe 20 people who can talk to the system. All you have to do is identify who you are, and the system goes to the disk, takes your voice parameters, loads them and it is ready. Now I suppose if you used this system as a Personal Computer extension, there would only be one hard disk, and it would not work for any number of people. We have a plan to squeeze the hardware into 12 cards, which could be used in a Personal Computer extension box. We think we will have that done this year. But you have to understand, this is just a design that will probably not meet IBM quality standards.



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Expert help for MVS

YES/MVS, or the Yorktown Expert System for MVS operators, is an experimental, continuous, real-time expert system designed to control an operating system interactively.

In essence, the expert system can perform automatically many of the functions of a computer operator. The software runs under IBM's VM/370 operating system on an IBM 3081 mainframe. The expert system was designed to monitor the MVS operating system running on another mainframe. This arrangement was made so that problems with YES/MVS do not interfere with the operation of the MVS system. If YES/MVS fails, the subject MVS system can still operate under manual control. Likewise any problems in the subject MVS system will not affect the operation of the expert system.

Currently, YES/MVS is partitioned into three virtual machines for speed and functional separation. One machine contains the MVS operator expert, another contains the MVS Communications Control Facility (MCCF), and the third is used to control the YES/MVS operator's display console.

Se June Hong, senior manager of knowledge systems at the Watson Research Center, recently discussed YES/MVS with Tom Henkel, senior editor, systems.

How did the YES/MVS project get started?

IBM hadn't officially done anything in artificial intelligence for some time. That gave us something of a reputation for being anti-AI, which was not true. The expert systems group was started in February 1983 with the goal of expanding the technical horizons of AI, while at the same time developing something concrete.

We spent three months searching for a domain that would give us something new to do. We didn't want to develop yet another expert system using existing technology. We wanted to do something advanced. We discovered that another group within IBM, the Computer Installation Management Group [part of the Computer Science Department] wanted to develop advanced tools for computer operators. It was an ideal marriage because the operator environment is a real-time, continuous operation situation — not session-oriented.

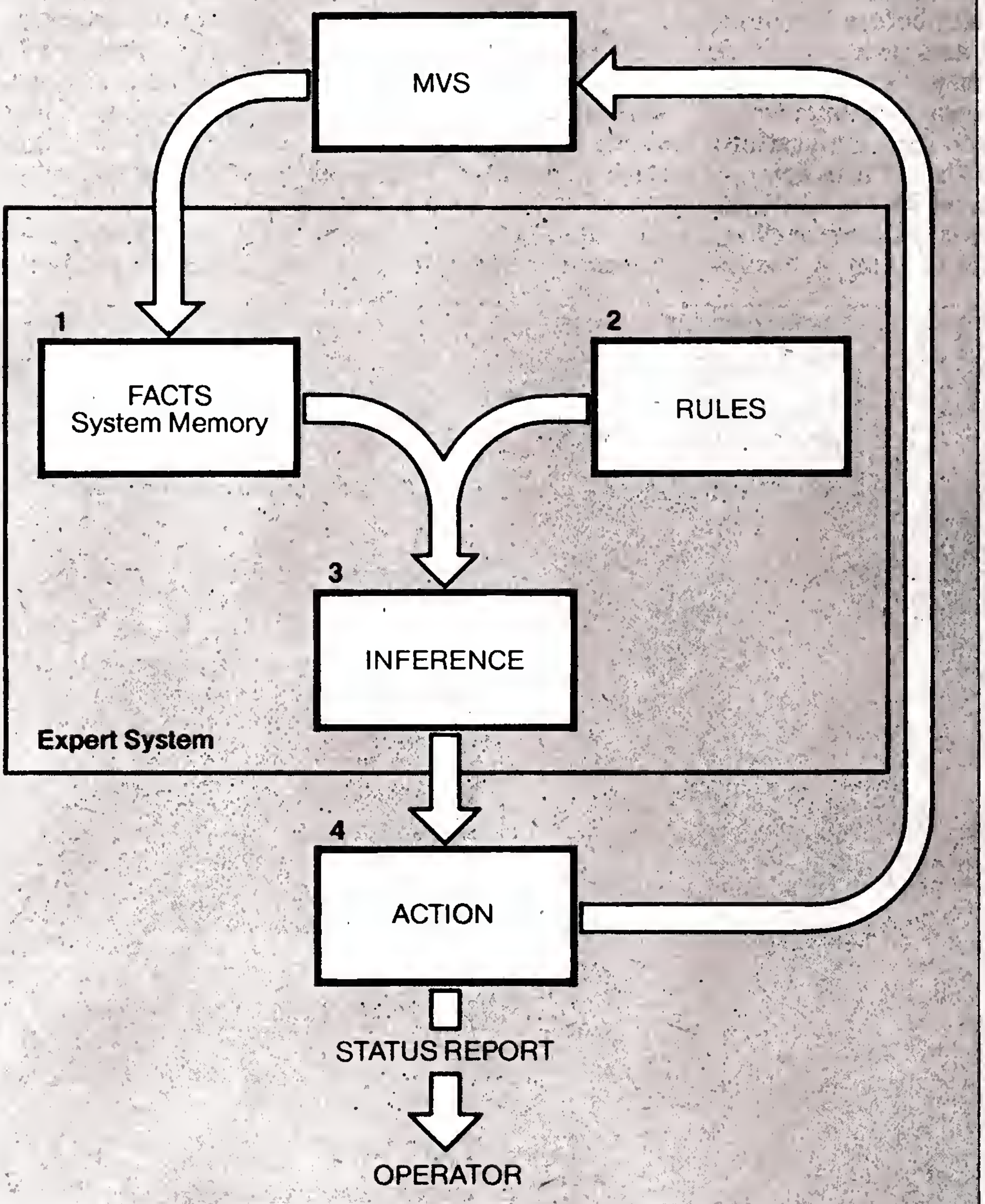
We took the OPS5 system that was developed at Carnegie-Mellon University and extended it to deal with real-time aspects, distributed processing and so on. After about a year and a half, we got it on-line.

In the beginning, YES/MVS operated like an operator's helper. It was saying "I suggest this" and asking operators what they thought. It was an advisory system.

Now YES/MVS does maybe two-thirds of all the operator's functions that are nonmanual. By "nonmanual" I mean things like answering phones, putting on tapes and shutting off switches. But other things, such as reacting to messages and trying to preallocate resources so things run smoothly, can be handled by YES/MVS.

An Expert System—YES/MVS—makes a "decision"

A goal of YES/MVS is to maintain the computer's job queue, its "in box," 50% available at all times. This is how YES/MVS would help achieve the goal. . .



This diagram illustrates how the experimental system YES/MVS makes a "decision." The goal of YES/MVS in this example is to keep 50% of the computer's job queue available at all times. The expert system will combine the facts it has about the system's condition with the rules it possesses to make an inference. It will either use the inference about the system to get more data or to make a "decision" about what to do in order to achieve or maintain the goal.

For example:

1 MVS says queue space is low (FACT).
2 . . .and a RULE says that when space is low, query the printer's state. .
3 . . .which is an INFERENCE. . .
4 . . .which results in a query (ACTION) to MVS. . .
. . .which starts the process over again, by determining that. . .
1 (FACT) a. The printer has a few short jobs
b. The printer is holding a long job
c. The printer is limited to printing 30,000 lines
. . .combining these FACTS with the
2 . . .RULE that if a, b and c are true, the correct
3 . . .INFERENCE is to raise the printer's line limit. . .
4 . . .an ACTION is initiated: raise the printer's line limit.

The action frees the computer's job queue, which was reacting to the large printing job on hold. This achieves the goal, that is, the system's job queue becomes at least 50% available.

Our goal was never to replace the operators. We wanted to give them high-level advice that would free their hands. In a critical situation, YES/MVS talks to the operator just as a human operator would in a critical situation. It consults with the operators.

Where did you find the experts to develop YES/MVS?

All over. We had gobs of expert systems programmers on this one. The way we got YES/MVS operating in an automatic mode is just like any other software. It had to run successfully for six or seven night shifts before it was brought up in the daytime. When we were running YES/MVS on the night shift, we tested by sabotaging the machine here and there and watching the response.

How much more work do you have to do before YES/MVS can be developed into a product for IBM customers?

Since we have published details of YES/MVS, we have been deluged with customer requests asking if they can have it today. We tell them to wait because it requires more development work. This is, after all, a single location, and YES/MVS has to be made portable. We must be able to change the rules to be able to accommodate different general policies, configurations and so on.

An interesting question is: How do you verify an expert system? It's an ironic question, and we really don't know the proper procedure.

Where will this project go from here?

It will go to a large machine group, the same people who designed OS. They will have to make it customizable so that it can go to any site of any size. They will have to increase the coverage so that it performs not only two-thirds of an operator's duties but covers everything. The large machine group will probably want to add functions beyond what operators do and make it into a total installation management package capable of doing capacity planning and long-term configurations.

Will you lose control of the project when it is transferred to the product development people?

I'll gladly lose control over it right now. The computer installation management group is continuing to work on YES/MVS, but as far as the expert systems group is concerned, we're happy, we're done. We want to do something else.

Do you know what your next project will be?

We're looking seriously in several directions. The YES/MVS project was, in a way, a crash project. We had to get a group on board and put ourselves on the map. We feel we have done that; now we want to get into some longer term research work.

Did the YES/MVS project develop out of someone's idea or was the need for the research prompted by the product development people?

Neither. This one developed out of the perception that expert systems are important. The technology is in its infancy; there is a lot to be done.

Since your first expert system research project was aimed at the mainframe sector, does that mean your future research will also be directed toward large systems?

We are not bound to big or small systems. We recognize that you often need a big system to develop an expert system that takes advantage of data bases and communications capabilities. It can also be economical to a big system because you are using cheap, dumb terminals. On the other hand, there is a rationale for using workstations. We're more interested in AI issues than the mechanical needs of implementing AI. Regardless of whether it is a small machine or a big machine, it is more the problem of somebody who is going to put out a product. I hope that will be someone other than me.

How do you balance your commitments to develop products for IBM and your desire to do basic research that will have an influence on the AI field?

The scientific portion of anything we do here at the Watson Research Center should be publishable. Exact information, such as implementation details, can be IBM-confidential. You can effectively isolate the company-confidential portions from the scientific portions. You can become an artist in doing that.

How does the research environment at IBM differ from the environment at an academic institution?

At the university level, you have more freedom to propose your own problems, propose your own axioms and solve your own theorems. In industry research, you are given an actual real-life problem, so you cannot extract clean axioms and solve clean theorems. It is inherently more difficult.

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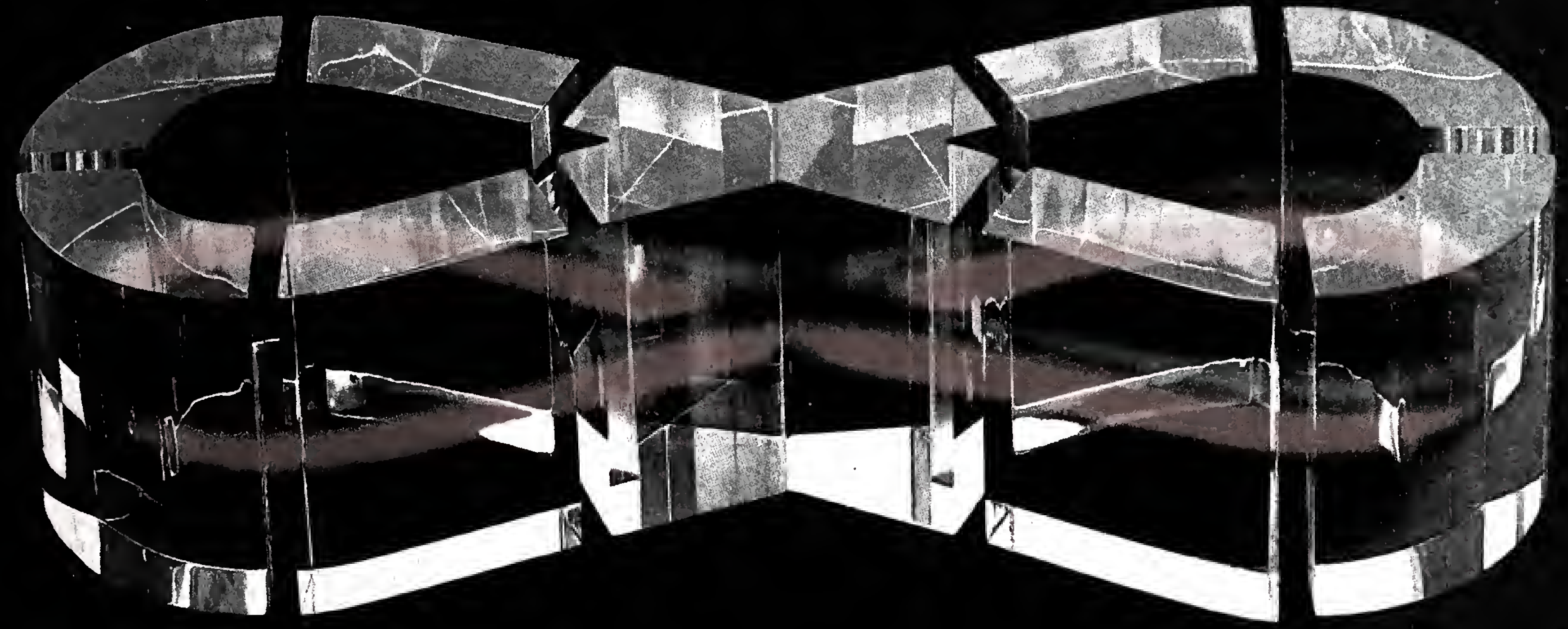

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INFOTRON SYSTEMS

Saying no to Josephson

British physicist Brian Josephson theorized in 1962 that circuits would become superconductive — lose virtually all resistance — when cooled to near absolute zero (about minus 400 degrees Fahrenheit). The essential technical problem for researchers was to cool the circuits in a liquid helium bath and still maintain the superior switching speeds of Josephson junctions.

IBM, Bell Laboratories and Sperry Corp. risked millions of dollars in the hope that Josephson circuits could become the basis of a new computer system.

By November 1983, all three had scaled back or scrapped their efforts, in effect giving up on Josephson technology. Japanese firms continue to research it.

George Harrar, senior editor, features, spoke to the men who made the decision to end Josephson research.

John Armstrong
Vice-president
Logic and Memory

I made the decision along with the man I report to and the man who headed the program who reported to me. The manager of that program came to me and said it was time to stop. Nobody had ever told us we were spending too much money. Plenty of technical folks in the silicon house thought that they were going to stay so far ahead that [Josephson technology] would never catch up. We did not drop that project because it was costing us too much money. We stopped because we know more about it than anybody else and yet can't make a good computer out of it.

The [Japanese] don't know yet as much as we do. There are basic difficulties with the Josephson device which will be, at the system level, extremely hard to get around. We had built large pieces of a small computer, done the packaging, built the logic chips with lots of gates on them, designed them to memories. We had some idea of how fast the computer would work.

Our view, at the moment, is that we do not see any really significant practical limitations to the continued evolution of silicon technology. There may be limitations — there is an end to everything somewhere — but it's not the main thing on our agenda to find a replacement for silicon. The main thing is "keep on with silicon."

You read in the press a lot about Josephson junctions that switch at 10 picoseconds or gallium arsenide devices switching in eight or nine picoseconds. Those are extraordinarily misleading [figures]. They accurately say how fast that little device switches when you don't require it to connect to anything else.

Never let anybody tell you that large U.S. corporations will not support high-risk technology ventures. Josephson was very high risk and IBM supported it very substantially. At the time we started, the individual switching speed of the Josephson device was far faster than any other device we knew about. And it was therefore hoped that a system built around such devices would be far faster than some other system.

What we found was, yes, we could build it, and it wouldn't be that much better than the silicon computer that would be available at the same time. That's why we stopped. It's not that we couldn't do it but that it wouldn't have been that much better.

Any technology that tries to displace silicon is shooting at a moving target. It's not enough even to think you can do marginally better. You have to be able, at the system level, to do dramatically better before it is a reasonable proposition to ask customers to go with a new technology. So this business about being "technologically advanced" — I think you have to be a little careful. What counts is not who has got the fastest device, or even who has got the most novel or nifty-sounding device, but who can integrate that into a system that delivers reliable and good performance.

We're studying gallium arsenide quite hard but not from the point of view that it is going to be the successor technology to silicon. We absolutely believe it's a fallacious notion that gallium arsenide will displace silicon. There may very well be applications in the communications between subsystems of a large computer system. I would think very likely that optical communications will play a role in systems of the future. There may be specialized signal processor applications, maybe situations where you need modest levels of integration.

People say, "This device is five times faster than the comparable silicon device; therefore, there will be a computer system five times faster." Wrong. What counts is how good the system is. You have to build it. You can come up with a new device that's good, and we support working on a lot of novel devices. You find one that looks particularly promising, now try to build chips. We build chips — that's good for openers, but it's not a computer. You have to have a package that does not squander the speed of your chip, assuming you've been able to keep the speed of the device at the level of the chip.

If you've still kept some of that advantage from the device level to the chip level, then you have to match that improvement with the package, so that at the module level you still have some advantage. But even so, one of these [modules] is not enough to make a computer. It takes nine of them. So they go on some board. You've got to have the technology for that board that does not

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Silicon at IBM: What's up?

Tak Ning walks between the two sides of silicon research — silicon bipolar and MOS [metal oxide semiconductor]. He heads the Silicon Devices and Technology Department, about 30 people divided into the two camps.

Ning, a research staff member for 11 years at IBM, investigates integrated process devices and technology. His group is part of the Advanced Silicon Technology Laboratory.

Ning spoke to George Harrar, senior editor, features.

IBM, if it's not the only one, is one of the very few industrial research organizations devoting significant resources to silicon bipolar devices. Other companies, when they work on VLSI [very large-scale integration], imply MOS and MOS only — in fact, Cmos [complementary metal oxide semiconductor]. Either we're crazy or we're up to something. I think history has proven that we're up to something.

Silicon bipolar has been, and as we see it, continues to be the backbone of the very high-speed computer. When I started working on bipolar, there were already publications saying there was no future. Many people believe that; as a result, they don't work on it. By not working on something, indeed there is no future.

We're trying to achieve two things for bipolar. One is the more traditional — very high-speed logic and memory. We are finding there is a lot of potential in bipolar VLSI as well.

I am making bipolar involving techniques that are familiar to people who work in MOS but not familiar to people who have been working on bipolar alone for many years. It's this coupling between one area and another that is really giving, in our view, life to bipolar.

At this moment, we have finished a lot of exploratory work down to half micron, using direct electron beam writing. We are pushing the half micron to Cmos and beyond, and also we have done quite a bit of work at one micron bipolar.

As far as bipolar vs. MOS — they understand in Fishkill [N.Y.], the IBM bipolar house, they understand very well why I should work on bipolar. They may ask why I should work on MOS. When I go to Burlington [Vt.], the MOS house of IBM, they understand why I should work on MOS. They may ask why I work on bipolar.

For the very high end of the computer — [it's] silicon bipolar. I don't believe MOS is able to do it in any time in the near future, do it in a competitive way. And similarly, for the more conventional VLSI, there is certainly a market for MOS.

squander the performance you've built into this module. Every one of those things adds something to the cycle time.

If you want to build a computer, you have to be experienced enough and technologically mature enough to understand all the trade-offs and all the considerations that go into it.

Leon Cookman
Director of Administration

We did not get out of the big program because we failed in anything we set out to do. We found that the performance gap between silicon as a semiconductor device and Josephson closed faster than we expected. The performance gap left just did not warrant switching to a whole new technology.

People tend to think that every decision in IBM is made in Armonk. That's not right. We are a pretty decentralized company. That decision to get out of Josephson was made here by the director of research after consulting with his people.

All of those people merely moved from the Josephson area into our other high-speed device work: silicon, gallium arsenide and so on. So we have as much work going on in high-speed devices for the future as we ever had. It's just that we moved our chips around on the betting board.

Joseph Logue
Manager of Packaging
Technology and Systems

This is a program I managed until a little over a year ago. It hasn't been stopped completely. We have a small effort continuing to look at the Josephson technology, but it's more in a research mode than in a development mode.

We had done quite a bit of work on packaging Josephson chips and substrates and so forth, but we haven't continued with that aspect of it. We're looking at the fundamental devices.

In terms of gallium arsenide, we are not actively engaged in the packaging program at this point. We feel that we have enough work going on in packaging in general that we can accommodate anything that would be needed for the gallium arsenide work, with maybe the exception of operating at liquid nitrogen temperature, in which case, the work that we've done on the Josephson program would probably be fairly applicable.

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Systems ideas put to the test

Even the systems center at IBM's Watson Research Center is a test bed for IBM products. For example, the information systems department recently moved an internally developed software package called PC/VM Bond into the commercial sector. The package links IBM Personal Computer users to the mainframe-based VM operating system.

Allan Weis, director of Computing Systems, manages this department, which serves mostly scientists and uses a large number of experimental programs.

He was interviewed by Tom Henkel, senior editor, systems.

What is your basic charter?

My charter is to provide service to the user community in research and to improve productivity. I buy machines from IBM and put a configuration together and try to provide really top service. Our configuration may be a little different from some of our customers' because we interconnect large machines and try to make them look like one machine to our user community.

We have terminals, or PCs, coming in through local switching and going to a large number of systems with shared data. Our configuration is a little unique, because if this one machine goes down, users can just go on one of the others and get their data. We can do that through local modifications to the system. This [the multiple pathing feature] is really a research project.

When the users here log on in the morning, we tell them which machine is performing the best, and they can log on to that machine. If during the day they are on one of the machines and the performance gets bad, the system will tell them to move over to one of the other machines.

These things are accomplished by a lot of modifications throughout the system. Those modifications are not as simple to transfer as something like PC/VM Bond.

[In the Yorktown Heights complex, there are two different sets of systems, one running VM and the other MVS. The VM complex includes six 3081s. The MVS complex consists of a 3084 that will be upgraded to a 3090 by midyear. There are also 20 4300 series systems, some running VM and some MVS.]

The PC Bond project originated in information systems and then developed into a commercial product. Was that the first for the department?

No. Over the years, we have been successful enough to ship 15 to 20 products. HSM [Hierarchical Storage Manager] was one, Resource Access Control Facility (RACF) was another. There are quite a number of success stories.

I suppose many people here at Yorktown Heights using your systems have suggestions on how they can be made a little better. Do you receive much input from the user community?

We have thousands of users who all know just a little more than we do and are very free with their suggestions on how we can improve things. And that is important. There are a lot of good people in the computer science department who know systems. And when they see something they don't like, they make suggestions. And many times we follow them.

> ”
>
> *We can try a product out with thousands of users pounding on it, and if we see problems, we can fix it.*

We try to establish an environment that encourages innovation that we can take advantage of. We have a shared disk on our system that any user can put his program on, once he follows a fairly simple set of procedures. For example, if someone wants to put a new interpreter language out there, he can announce it on a bulletin board. When everyone logs on in the morning, they will find a poster that says there's a new interpreter language on the shared disk along with information on where to get additional information. And people can use it and feed back.

There is a correlation between what is on that disk and what has moved into the product area; Rex is one that comes to mind. Rex is one of the interpretive languages that is on VM/370. It came out of the computer science department. They put it on the shared disk, and it was pounded away by the users. It improved until the product people became interested.

A complimentary example is PC/VM Bond. Our user community here knows Rex and thought we should have that on a PC. So we implemented a Rex interpreter for the PC. And that came out as part of the PC/VM Bond product.

We have a very demanding user community. We put whatever we do in-house and let our user community try it. And it evolves over the years into something that is reasonably good.

There are distinct user communities out there. There are, for example, administrative people, scientists and computer scientists. The programming community is very large, and when we make a change, for example to an editor, we have many people who don't like what we

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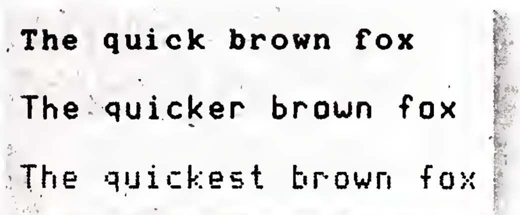
The Pinwriter lets you do more than any other dot matrix printer. Three different speeds cover all your needs—300, 900 or 1800 words per minute.



The quick brown fox

The quicker brown fox

The quickest brown fox

Three printing speeds cover all your needs

Pinwriter printers also let you create unbelievably clear graphics. In black and white. Or in seven crisp colors.

With Pinwriter, you can change spacing, type pitch, and speed with one finger.

But that's not all. Every Pinwriter gives you a choice of 8 different type styles. Plus, you can choose from a wide range of easy-to-use NEC forms handlers.

And to make things even easier, Pinwriter printers work with the most popular PCs and software packages.

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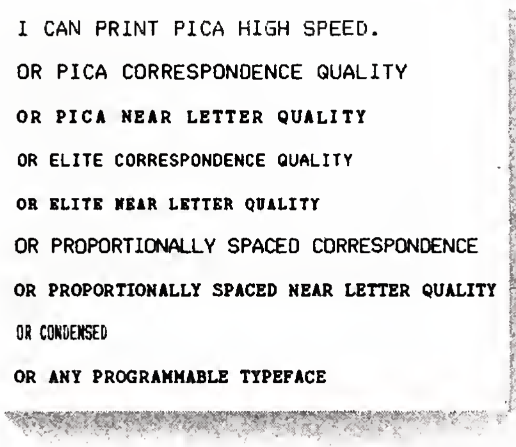

I CAN PRINT PICA HIGH SPEED.
OR PICA CORRESPONDENCE QUALITY
OR PICA NEAR LETTER QUALITY
OR ELITE CORRESPONDENCE QUALITY
OR ELITE NEAR LETTER QUALITY
OR PROPORTIONALLY SPACED CORRESPONDENCE
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OR CONDENSED
OR ANY PROGRAMMABLE TYPEFACE

The Pinwriter prints in 8 different typefaces at the touch of a button.

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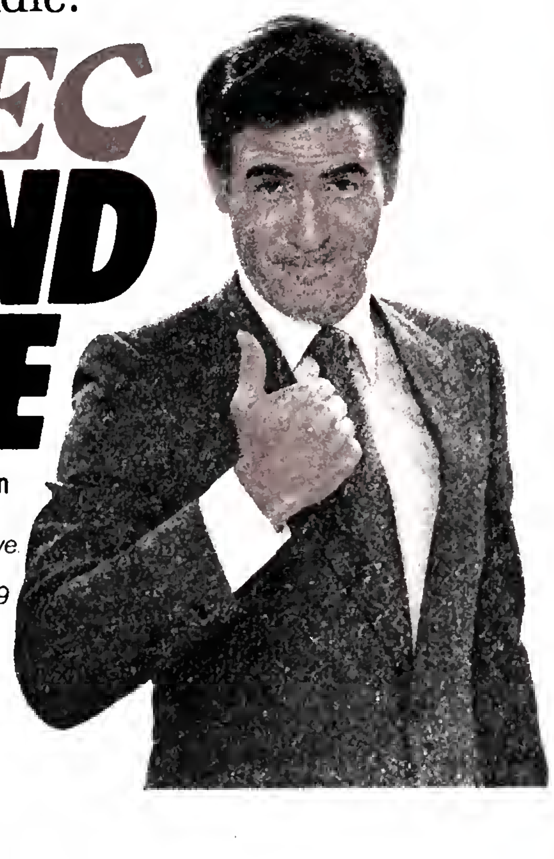
NEC AND ME



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Department 1610
Boxborough, MA 01719

do. And they feed back. That is how things get better.

Do you keep your ear to the ground to keep track of experimental projects going on in other parts of IBM?

We look all through IBM. We work with the product people. If we find a product that looks like it may solve some of our requirements two or three years from now, we try and get early versions of it. Among the products we received early and worked on was the 3800 Model 3 all-points-addressable laser printer. Another example is the 3880 disk controller models D11 and D13.

I have a half-dozen unannounced products that we are using here now. We are evaluating them and feeding back to the product people. We are a unique test bed because we can try out a new product in an environment that is much better than the average test sequence. We can try it out with thousands of users pounding on it, and if we see problems, we can fix it. In the case of the 3880 controllers, we made some modifications to the VM operating system to make the controllers run more efficiently.

> ”
>
> *You can keep on introducing change and you can keep on developing things as long as your systems are stable. And to keep them stable, you have to have a good management system for introducing change.*

And we can let the product people know what is wrong with a product and let them fix it for our environment, if they don't want to take what we have done.

Your department appears to be halfway between the research and product development stages. How do you fit into the IBM product development scheme?

First and foremost, we provide a service. And as long as the service is good, we'll survive. Second, when I see an opportunity to improve the service, I'll take a few spare resources and apply them there. If we're successful, we'll go to the product guys and say, "Do you like it?" And most of the time, they say it has passed the test of being pounded and is useful. Sometimes they say, "But it doesn't fit with our strategy" or, "It is low on our priority list." Most of the time, they will send someone down to see if a project can be transferred into a product.

Technology transfer is based on many things, one of which is, "What have you done in the past?" We have a reputation for producing relatively good things.

One's reputation, or track record, appears to be very important at Yorktown Heights. Does that quest for a good reputation influence your research? Are you reluctant to get into a situation where an idea could fail because it could damage your reputation?

No, it is not an influence. I have two or three things going that most probably will not make it. The difference between someone who is successful and someone who isn't is that the successful people try and minimize the things that aren't going to succeed. They recognize them sooner rather than later. And the things that separate the really good guys are they know what is going on both inside and outside IBM. They really minimize the number of bad directions they take. But we all take risks.

How do you determine when you have done enough research and an experiment is not going to pan out?

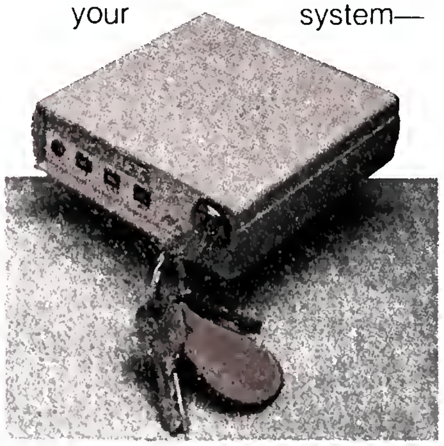
I'm different from the physics department, the logic department or other departments. I don't do any work unless I can see results within two to three years. If I see a project wandering without real hard results or it is not progressing well, I think it is a candidate for redirection.

How do you balance the desire to develop new projects with the responsibility to provide a stable environment for systems users here at the Watson Research Center?

There is always a conflict between change and stability. Every installation manager is faced with that same dilemma. We have a good set of management procedures on how to introduce change into our systems. We introduce change very slowly and in a very sequenced way. Our procedures are probably very similar to those of the big banks or airlines. We change our systems very frequently, probably more than most of our customers. You can keep on introducing change and you can keep on developing things as long as your systems are stable. And to keep them stable, you have to have a good management system for introducing change.

Have SECURE dial access to ANY computer using NO passwords and NO dialback with DATA LOCK & KEY™

Simply connect a **DATA LOCK** (shown above) between your mainframe and your modems. Issue the portable **DATA KEYS** (shown below) to all authorized personnel. Only these members of your staff can access your system—



from any telephone—and they need no passwords! They simply dial in, and are connected.

NO PASSWORDS?

Only a **DATA KEY** can provide correct responses to the large random numbers sent by the **DATA LOCK.** Thus the LOCK quickly identifies authorized users, and allows them to access the mainframe. Because the numbers are random, the dialogue between **LOCK** and **KEY** is different every time a user dials in.

Access is not dependent on passwords remembered, forgotten or passed along, so it is faster and more secure.

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- Date, time and details of all calls handled.
- Statistics of line usage.
- Unauthorized **DATA KEYS** (i.e. lost or stolen **KEYS**).

SPECIFICATIONS

DATA LOCK & KEY™ works with all computers and modems with RS232 connections. The system is compatible with async, Bisync, SNA/SDLC and all other protocols. No adjustments are necessary for protocol, baud rate, modem type, etc. Protocols and mainframes of different types can be simultaneously supported by one **DATA LOCK.**

LINES SUPPORTED:
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DATA KEYS supported by DATA LOCK: any number.

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Part one

Power to the users

By Pieter Mimno

Major changes are occurring in fourth-generation language application development techniques. New technology and fresh ideas are causing rapid improvements in the effectiveness and applicability of high-productivity languages.

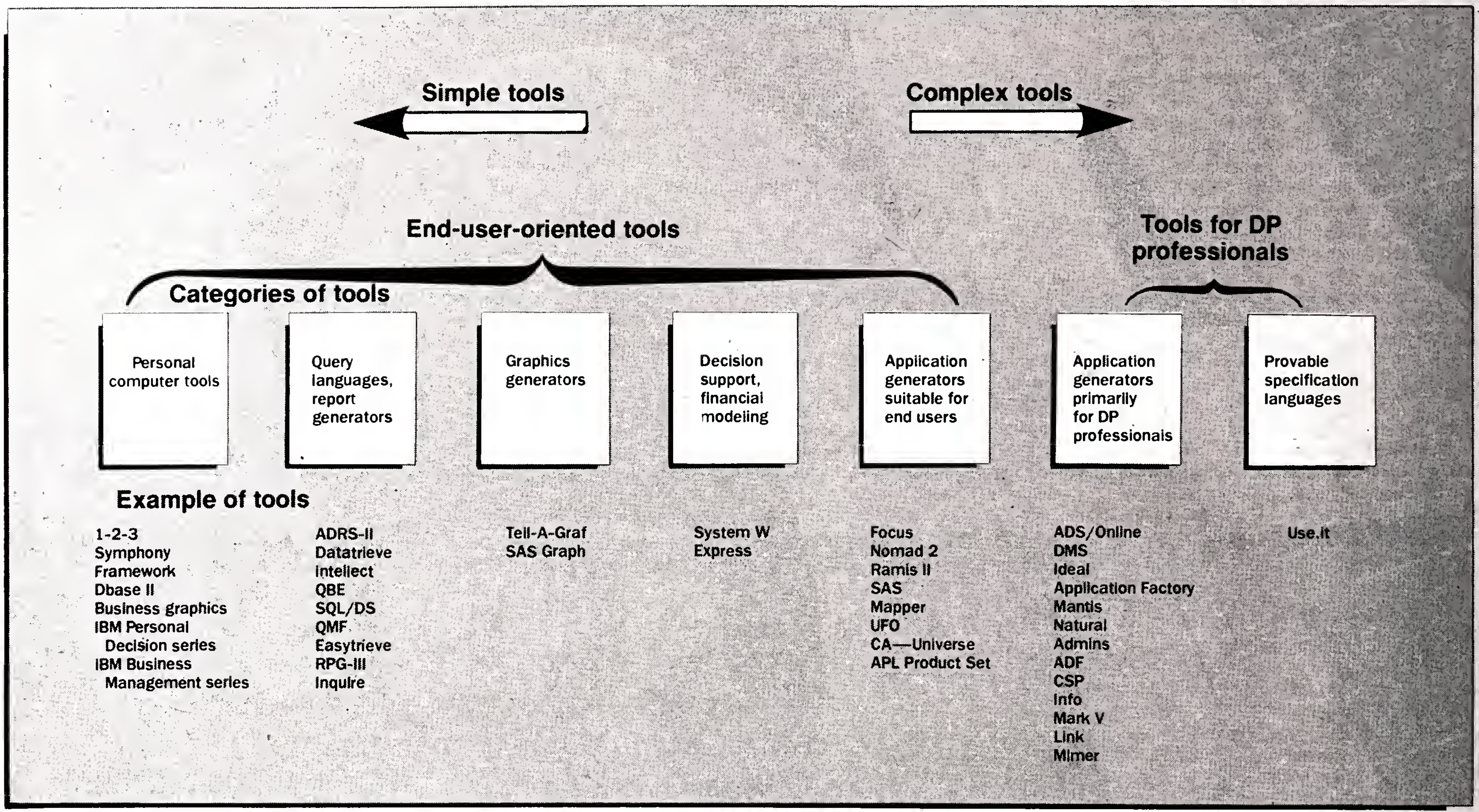
End users can now be provided with simple fourth-generation language tools that enable them to process routine applications without assistance from DP. Organizations typically report productivity improvements of 10:1 relative to Cobol for end-user-driven information processing applications that do not require much procedural logic.

DP professionals can use more complex versions of these same tools to build large-scale batch or on-line applications. Moderate to large-scale applications requiring an extensive amount of customized procedural logic may be built three to four times faster with fourth-generation languages than with Cobol.

Intense demand for simplified access to computers and for increased development productivity has resulted in dozens of new and improved fourth-generation language tools. The ensuing competition has led to a striking improvement in the way computers are used.

Most fourth-generation language tools have been developed within the U.S. for an IBM environment. *The James Martin Report on High-Productivity Languages* tracks 45 leading fourth-generation language tools.

The second part of this two-part series will cover fourth-generation products.



Charts reprinted with permission of *The James Martin Report on High-Productivity Languages*, published by Technology Insight, Inc.

Figure 1. Categories and examples of development tools

Of these 45 tools, 43 originated in the U.S., and 35 were developed for an IBM environment. This does not reflect a bias toward U.S. tools or toward the IBM environment. It is simply the result of intense competition within the U.S., coupled with a lack of effort in foreign countries.

Significant changes in application development techniques are now occurring:

■ Familiar manual development techniques used for 15 years or more are being replaced by more efficient automated techniques.

■ Tools appropriate for end users are being widely used for data query, data input and editing, report generation, graphics generation, decision support systems and some categories of application generation.

■ End users are moving rapidly toward a distributed computing environment in which a personal computer is used as an intelligent workstation for local data manipulation and a mainframe is used to store corporate data.

■ Information centers are beginning to provide a stable, well-supported environment for end-user computing.

■ Automated development tools appropriate for DP professionals are now available that replace the need for Cobol for most business applications.

■ Provable specification techniques generate code automatically from bug-free specifications.

■ Entirely new technologies are springing up that will eventually eliminate the need for hand code for all applications.

Fourth-generation languages are difficult to define. One simple definition requires that a language not be called "fourth generation" unless the following holds true:

■ Users can obtain results in one-tenth the time required by third-generation languages such as Cobol and Fortran.

■ The system is user-friendly, user-seductive and easy to learn and remember.

■ The tool is appropriate for use by both end users and DP professionals.

Another way to define fourth-generation languages is to list the categories of application generation languages:

■ Integrated personal computer tools.

■ Query languages and report generators.

■ Graphics languages.

■ Decision support and financial modeling systems.

■ Application generators suitable for end users.

■ Application generators intended primarily for DP professionals.

■ Provable specification languages.

Language tools

Figure 1 shows representative categories of fourth-generation language tools and includes examples of specific tools in each category. Products listed on the left side of the figure require little or no data processing experience. In many cases, an end user can make effective use of these products with no support from DP personnel. The more complex products listed on the right side of the figure are intended to be used by experienced DP professionals. Figure 2 provides a listing of leading high-productivity tools.

As shown in Figure 1, a non-DP professional can start with simple facilities, such as stand-alone personal computer tools, and progress to more complex and powerful tools.

Integrated tools

Many business professionals who lack experience with computers find it necessary to access and manipulate information from the corporate

Better than the higher priced spreadsheet.

ESS

All mainframe spreadsheets are not created equal. With a little comparative analysis you'll see they're not priced equally either.

ESS is more powerful than many other spreadsheets made for IBM mainframes running VM/CMS or MVS/TSO. In fact, it has more spreadsheet capabilities than some of its competitors costing several times as much.

Yet ESS is simple to use. Within minutes anyone familiar with Lotus 1-2-3 or VisiCalc can be using ESS. And ESS is sophisticated enough for even the most experienced users.

While other spreadsheets brag about giving you hundreds or thousands of columns and rows, ESS gives you as much as your computer has the capacity to store. And while other vendors charge extra for advanced capabilities ESS includes them in one easy to install product.

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data base. The ideal first step for them is to purchase an IBM Personal Computer or equivalent machine and learn how to use simple, end-user-oriented tools, such as Lotus Development Corp.'s 1-2-3 or Symphony, Ashton-Tate's Dbase III or Framework or the IBM Personal Decision series and Business Management series.

The next logical step for the business professional: Download data from the corporate data base and process that data on a personal computer using integrated personal computer tools. Several tools provide the capability to utilize a personal computer to request information from a data base on an IBM mainframe. These products include Artificial Intelligence Corp.'s Intellect; Comshare, Inc.'s System W; Information Builders, Inc.'s Focus; Mathematica Products Group, Inc.'s Ramis II; D&B Computing Services' Nomad2; Cincom Systems, Inc.'s Mantis; Software AG of North America, Inc.'s Natural; and Cullinet Software's ADS/On Line.

The data is automatically transmitted to the personal computer in the format required by 1-2-3 or Dbase III. The user can then operate on the data using the personal computer tools with which he is already familiar.

Query languages

Query and update languages on either a personal computer or a mainframe let users interact with a computer using a simple, easy-to-understand language. Examples of leading mainframe query languages include Intellect; Digital Equipment Corp.'s Datatrieve; IBM's QMF, SQL/DS or Query-by-Example (QBE); Pansophic Systems, Inc.'s Easytrieve; and Infodata Systems, Inc.'s Inquire. Using Intellect, queries can be made using everyday conversational English, such as:

REPORT THE BASE SALARY, COMMISSIONS AND YEARS OF SERVICE BROKEN DOWN BY STATE AND CITY FOR SALES CLERKS IN NEW YORK AND MASSACHUSETTS.

Requests such as this one may invoke automatic searching or joining of multiple data base records. Because of the searching or joining operations, query languages are tied closely to their associated data base management systems (DBMS).

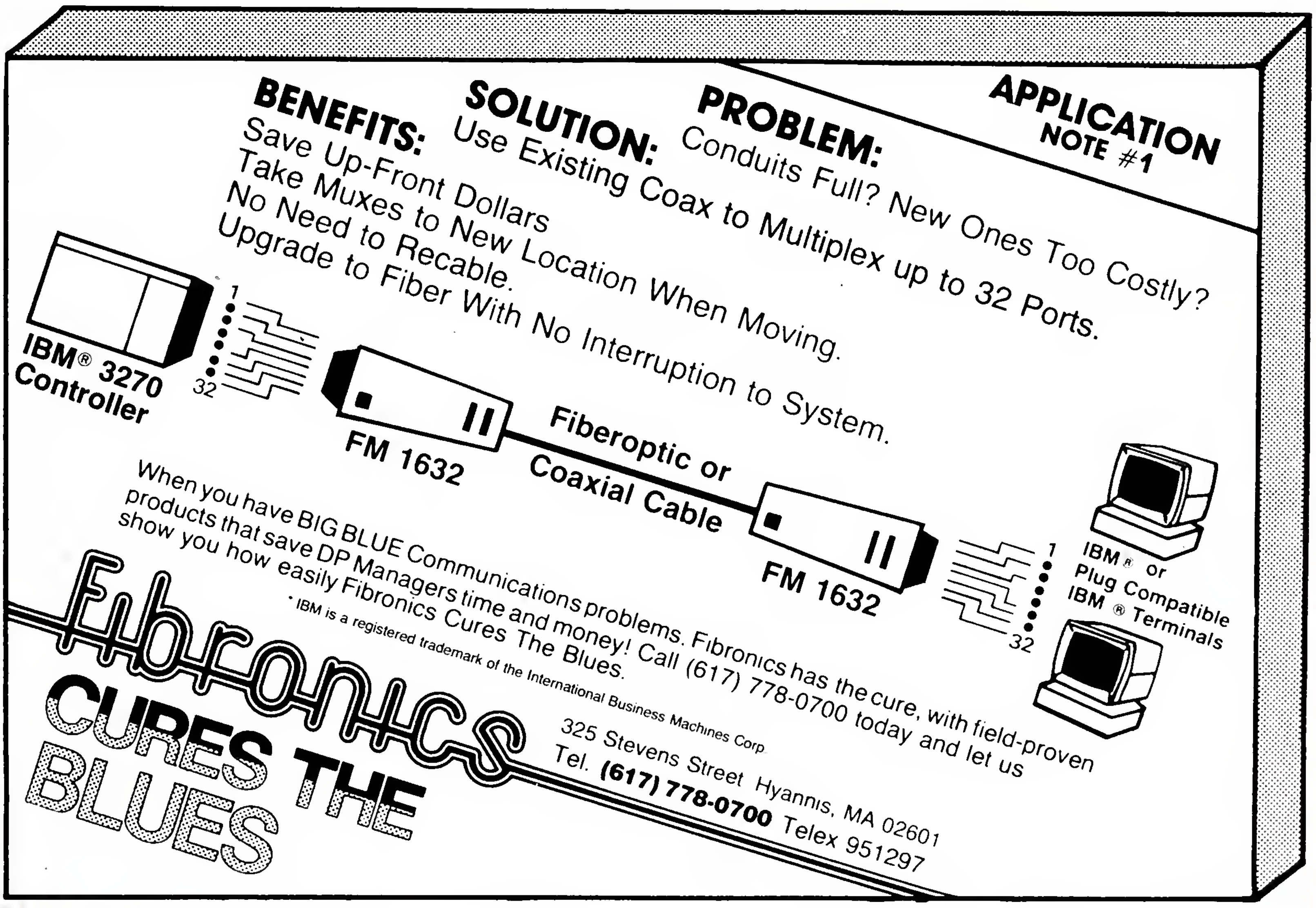
Report generators are used to extract required information from a data base, to manipulate the data, to build files and to produce formatted reports. Good report generators allow substantial arithmetic or logic to be performed on the data before it is displayed or printed. Many report generators integrate with query facilities and a data base system. In general, they are easy to learn and highly versatile. Examples include IBM's ADRS II, Datatrieve, Intellect, QBE, SQL/DS, QMF, Easytrieve, RPG III, Honeywell, Inc.'s Personal Data Query and Inquire.

The most comprehensive graphics facilities for mainframes are provided by dedicated tools such as Integrated Software Systems Corp.'s Tell-A-Graf. Routine presentation graphics requirements are easily met by the graphics components of integrated personal computer tools such as 1-2-3 or Framework as well as the graphics components of full-function application generators such as Focus, Ramis II, Nomad2, Mantis and Natural.

			Suitable for	
Category/Product	Vendor	Environment	End User	Analyst
Integrated personal computer tools				
Dbase III	Ashton-Tate	IBM Personal Computer, Various	✓	✓
Framework	Ashton-Tate	IBM Personal Computer, Various	✓	✓
Symphony	Lotus Development	IBM Personal Computer, Various	✓	✓
1-2-3	Lotus Development	IBM Personal Computer, Various	✓	✓
Query languages and report generators				
ADRS-II	IBM	IBM	✓	✓
Datatrieve	DEC	DEC	✓	✓
Easytrieve	Pansophic Systems	IBM, Siemons	✓	✓
Inquire	Infodata Systems	IBM	✓	✓
Intellect	Artificial Intelligence	IBM, Honeywell	✓	✓
RPG-III	IBM	System 38	✓	✓
QBE	IBM	IBM	✓	✓
QMF	IBM	IBM	✓	✓
SQL/DS	IBM	IBM	✓	✓
Graphics				
Business Graphics	Business Professional Software	IBM Personal Computer, Various	✓	✓
Tell-A-Graf	Issco	IBM, DEC	✓	✓
Decision support and financial modeling				
Express	Management Decision Systems	IBM, Prime	✓	✓
System W	Comshare, Inc.	IBM, IBM Personal Computer	✓	✓
Application generators suitable for end users				
CA — Universe	Computer Associates	IBM, DEC, Data General Corp.	✓	✓
Focus	Information Builders	IBM, IBM Personal Computer	✓	✓
Mapper	Sperry Corp.	Univac 1100	✓	✓
Nomad 2	D & B Computing	IBM	✓	✓
Ramis II	Mathematica	IBM, IBM Personal Computer	✓	✓
SAS	SAS Institute	IBM, DEC, DG	✓	✓
UFO	Oxford Software	IBM	✓	✓
Application generators for DP professionals				
ADS/Online	Cullinet Software	IBM	*	✓
CSP	IBM	IBM		✓
DMS	IBM	IBM		✓
Application Factory	Cortex Corp.	DEC	*	✓
Ideal	Applied Data Research	IBM	*	✓
Info	Henco, Inc.	IBM, DEC, Prime	*	✓
Linc	Burroughs Corp.	Burroughs	*	✓
Mantis	Cincom Systems	IBM	*	✓
Mark V	Informatics General	IBM	*	✓
Mimer	Savant Institute	IBM, various	*	✓
Natural	Software AG	IBM, DEC	*	✓
Provable specification language				
Use.it	Higher Order Software	DEC VAX		✓

* Subset may be suitable for end users.

Figure 2. Leading fourth-generation language products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Decision support and financial modeling tools help business professionals solve business problems. They help users analyze data, answer "what-if" questions, create financial or other models and generally extract meaningful information from complex data.

There are basically three categories of decision support systems (DSS):

- Simple, two-dimensional spreadsheet tools for the IBM Personal Computer, such as 1-2-3, Framework, Microsoft Corp.'s Multiplan, Software Arts, Inc.'s Visicalc, Comshare, Inc.'s Micro W and the Plans Edition component of IBM's Personal Decision series software for the Personal Computer.
- Mainframe DSS tools capable of manipulating complex business models in multiple dimensions, such as System W and Management Decision Systems Corp.'s Express.
- Highly sophisticated tools, such as Express, that incorporate powerful operations research techniques and multidimensional relational data bases.

The end user may start with simple, two-dimensional spreadsheet tools for the personal computer, which are capable of building business models of moderate complexity. When it becomes necessary to analyze models in more than two dimensions, the user may then move on to the more powerful mainframe tools such as System W and Express. These tools maintain the data base separately from the model equations and support functions such as rate-of-return calculations, discounted cash flows, currency conversions and so on.

Application generators

Application generators are integrated fourth-generation language tools that permit an entire application to be generated. The most useful full-function application generators support a wide range of integrated components, including a DBMS, data dictionary, security facilities, query language, report generator, screen painter, graphics generator, decision support or financial modeling tools, multiple end-user interfaces, high-level procedural language, data definition language, distributed processing facilities, a micro-to-mainframe communications link and a separate version of the tool for a personal computer.

Rather than using separate tools to perform query, reporting, graphics, decision support and application generation functions, the user can apply one highly comprehensive tool to perform all of these functions. These integrated tools provide a single, consistent interface to the user rather than the multiple, disjoint interfaces offered by separate, specialized tools.

Application generation tools that are oriented toward end users include Focus, Ramis II, Nomad2, SAS Institute, Inc.'s SAS, Sperry Corp.'s Mapper, Oxford Software Corp.'s UFO, Computer Associates International, Inc.'s CA-Universe, IBM's TIF and Hogan Systems, Inc.'s Umbrella System. Of these tools, Focus, Ramis II and Nomad2 provide the most comprehensive set of integrated facilities.

Most of these languages are relatively easy to use and generally contain a subset of functions that are suitable for use by end users. Three of these tools (Focus, Ramis II and Nomad2) support a version of the tool that may be run on an IBM Personal Computer, Personal Computer XT or Personal Computer XT/370. Routine applications not requiring a large amount of procedural logic can often be developed in one-tenth the time required to write an equivalent Cobol program by hand. The resulting application contains far fewer errors and is much easier to debug than a hand-generated Cobol program.

Faster results

These factors together make it possible to obtain results much faster than with traditional programming. Recently, several integrated application generators have become powerful and versatile enough to permit the elimination of hand code for most business applications.

Many of the application generators available today aim more for DP professionals than for end users. These heavy-duty tools provide a full range of capability to implement transaction processing applications and complex logic. In many cases, an application can be tailored to run efficiently in a heavily loaded on-line transaction processing environment.

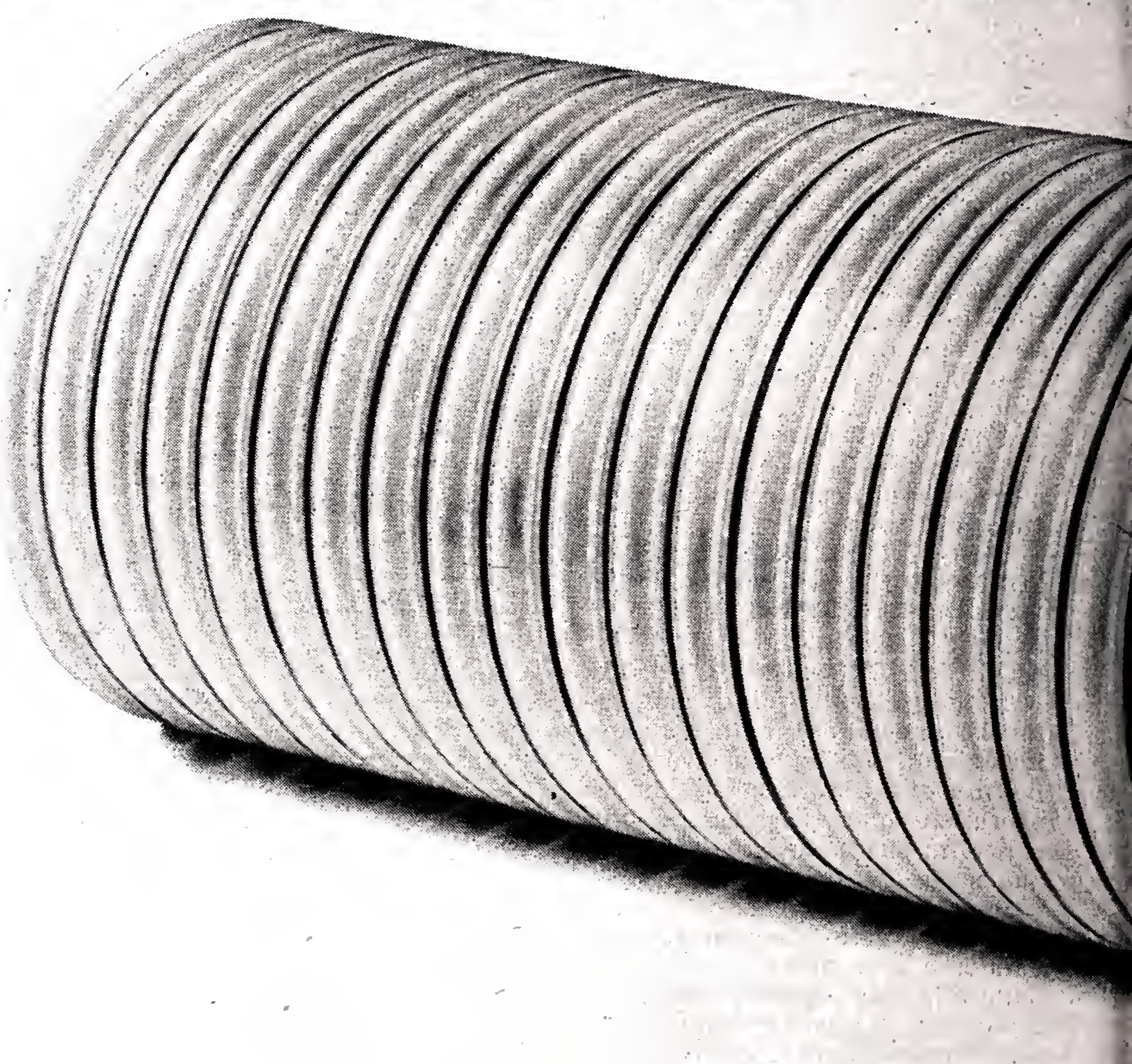
Application generators for DP professionals generally include a very high-level procedural language that is used to specify logical operations. These tools are usually integrated with a full-function DBMS that supports both relational and other data structures.

Examples of application generators for DP professionals include Applied Data Research, Inc.'s Ideal; ADS/On Line; IBM's ADF, CSP and DMS; Natural; Mantis; Cortex Corp.'s Application Factory; Pansophic Systems, Gener/OL; Henco Software, Inc.'s Info; Informatics General Corp.'s Mark V; Burroughs Corp.'s Linc; and Uppsala Data Centre's Mimer.

Techniques now available enable analysts who are not mathematicians to create specifications that are free of logical errors. Currently, the only practical tool using provable specification techniques is the Use.it system developed by Higher Order Software.

The unique feature of Use.it is that it has the ability to prove mathematically the logical correctness of specifications. Errors in specifications that have been detected automatically by the system may be easily corrected by the user.
Specifications that have been proven

For fast relief



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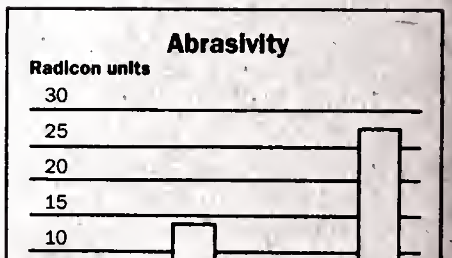

Radicon Test measurements above are obtained by running different computer tapes over an irradiated tape drive head. The higher the count of irradiated particles rubbed onto the tape, the more abrasive the tape.

by Use.it to be logically correct may be converted automatically into program code and consistent documentation for a specified system environment.

Major trends

The intense competition between fourth-generation language products and the development of better technology are resulting in the following significant improvements in fourth-generation language tools:

■ **Integration.** Formerly distinct functions are being combined to produce powerful integrated tools with a common user syntax.

■ **Automation.** Manual development techniques are being replaced by automated techniques.

■ **Accessibility.** Fourth-generation language tools are becoming accessible to a much broader range of end users.

■ **Personal Computer versions.** Several of the leading fourth-generation languages are available in versions that run on the IBM Personal Computer XT or XT/370.

■ **Information center orientation.** Full-function fourth-generation language tools are ideally suited for use in an information center environment.

A composite of the features supported by leading full-function fourth-generation languages is presented in the box at right. These are features that a potential buyer should seek.

Integrating functions

Rather than acquiring numerous incompatible tools, each supporting one or more functions, it is much more effective to select development tools that integrate as many useful functions as possible within a common command and operational framework.

For example, Focus, Ramis II and Nomad2 provide support for both relational and hierarchical structures, support of external data files, a data dictionary, query language, report generator, graphics generator, screen painter, procedural language, interfaces to external languages, financial support tools, distributed processing functions and support for a separate version of the tool on an IBM Personal Computer or XT/370. Other leading full-function fourth-generation languages such as Natural, ADS/On Line, Mantis, Ideal and Application Factory provide a smaller subset of these functions.

More limited fourth-generation languages such as SAS, Mapper,

Buyers' guide to features

Leading full-function fourth-generation languages provide integrated support for most of the following features:

Nonprocedural functions

■ Natural English interface.
■ Two-dimensional menu interface.
■ Command language interface.
■ Query language.
■ Report generator.
■ Graphics generator.
■ Screen painter/screen generator.
■ Relational front-end facility.
■ Automated front-end definitional facility.
■ Smart editors.

Procedural functions

■ High-level procedural (coding) language.
■ Full set of structured constructs.
■ Transaction processing language.
■ Action diagramming techniques.
■ Interfaces to external languages (Fortran, Cobol, PL/I, APL, Assembler).
■ Performance enhancement functions.

Data-related functions

■ DBMS (relational, hierarchical and hybrid).
■ Support of multiple industry-standard data bases (IBM's IMS, Vsam and SQL/DS; Cullinet Software, Inc.'s IDMS/R; Software AG's Adabas; and Applied Data Research, Inc.'s Datacom/DB).
■ Data dictionary.
■ Data security.
■ Rollback/restart protection.
■ Data extractor.
■ Automatic data navigation techniques.
■ Data definition language.
■ File browsing facility.
■ Data base design techniques.

Financial support tools

■ Financial modeling language.
■ Statistical analysis.
■ Electronic spreadsheets.
■ Interfaces to standard statistical packages (SAS, IFPS and others).

Distributed processing facilities

■ Multiuser environments.
■ Support of standard teleprocessing monitors (CICS, TSO, CMS and others).
■ Distributed data base.

IBM Personal Computer support

■ Separate version of tool that runs stand-alone on IBM Personal Computer or Personal Computer XT/370.
■ Micro-to-mainframe communications link.
■ Interface to standard Personal Computer tools (Lotus Development Corp.'s 1-2-3, Ashton-Tate's Dbase III and others).
■ IBM 3270 emulation.

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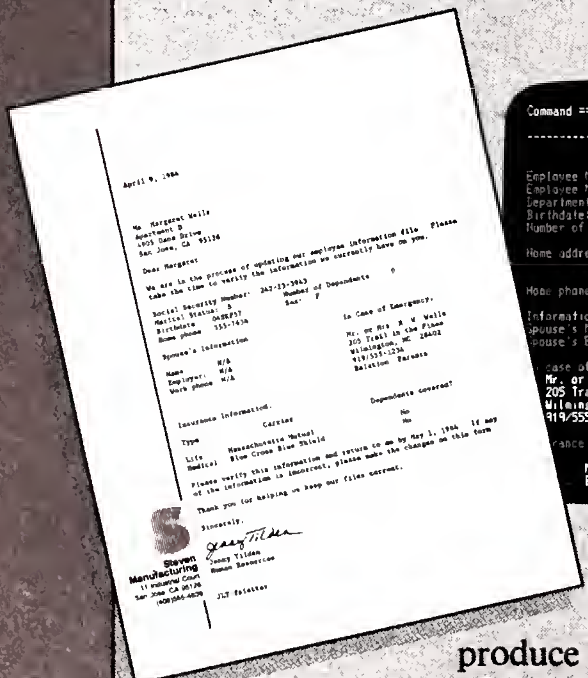
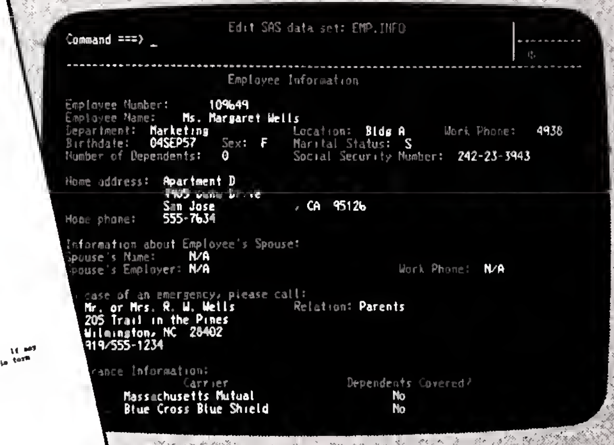
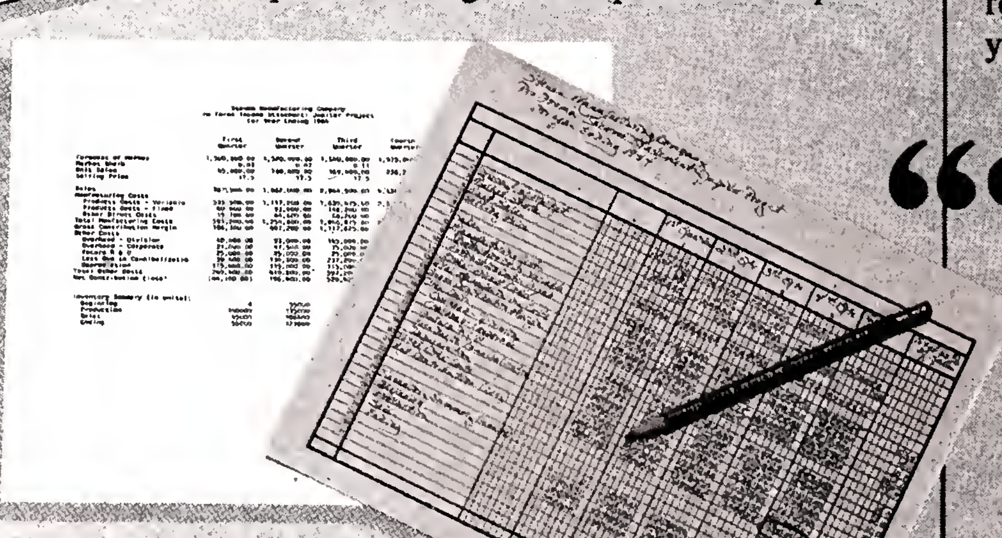




```
                    Edit SAS data set: EMP.INFO
Command ===> _
-----------------------------------------------------------------------
                    Employee Information

Employee Number:      109649
Employee Name:     Ms. Margaret Wells
Department:  Marketing             Location:  Bldg A      Work Phone:   4938
Birthdate:    04SEP57    Sex:  F   Marital Status:  S
Number of Dependents:    0         Social Security Number:  242-23-3943

Home address:  Apartment D
               4405 [illegible] Drive
               San Jose              , CA  95126
Home phone:    555-7634

Information about Employee's Spouse:
Spouse's Name:     N/A
Spouse's Employer: N/A                                  Work Phone:  N/A

 case of an emergency, please call:
 Mr. or Mrs. R. W. Wells           Relation: Parents
 205 Trail in the Pines
 Wilmington, NC  28402
 919/555-1234

 rance Information:
              Carrier                    Dependents Covered?
        Massachusetts Mutual                     No
        Blue Cross Blue Shield                   No
```

The accounting staff can quickly produce budgets and spreadsheet reports.



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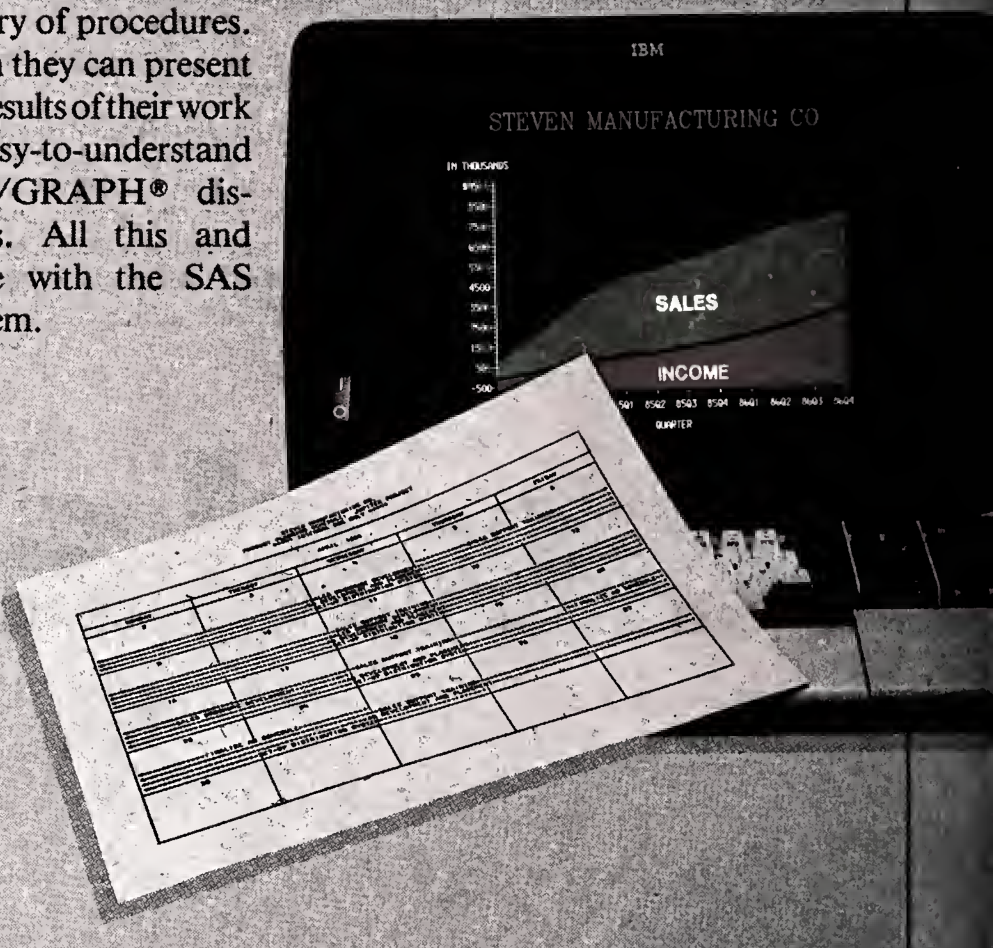

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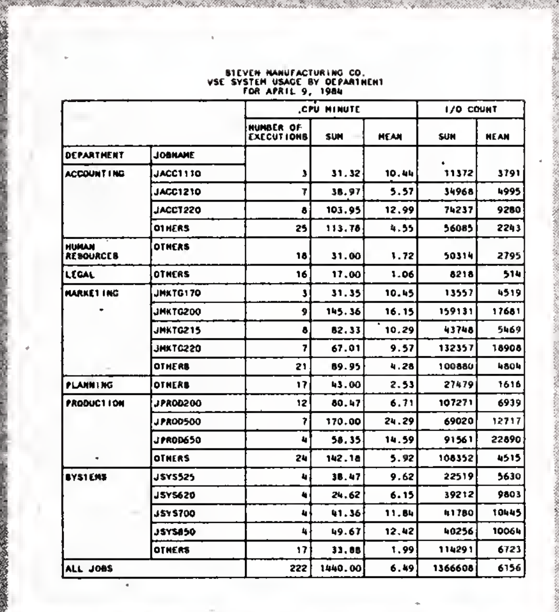

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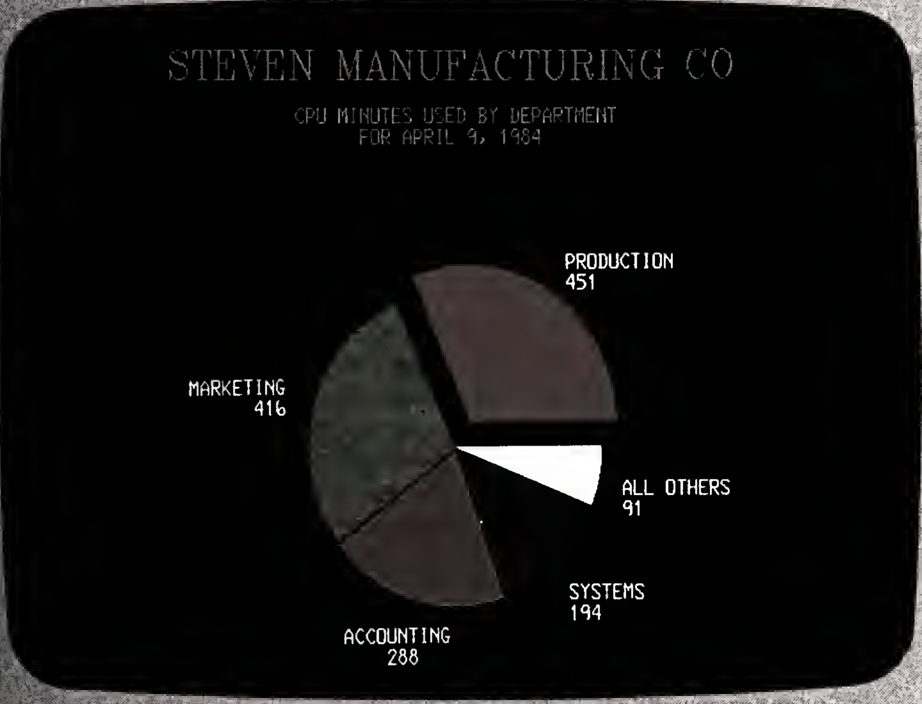
VSE SYSTEM USAGE BY DEPARTMENT
FOR APRIL 9, 1984

		CPU MINUTE			I/O COUNT	
		NUMBER OF EXECUTIONS	SUM	MEAN	SUM	MEAN
DEPARTMENT	JOBNAME					
ACCOUNTING	JACC1110	3	31.32	10.44	11372	3791
	JACC1210	7	38.97	5.57	34968	4995
	JACCT220	8	103.95	12.99	74237	9280
	OTHERS	25	113.78	4.55	56085	2243
HUMAN RESOURCES	OTHERS	18	31.00	1.72	50314	2795
LEGAL	OTHERS	16	17.00	1.06	8218	514
MARKETING	JMKTG170	3	31.35	10.45	13557	4519
	JMKTG200	9	145.36	16.15	159131	17681
	JMKTG215	8	82.33	10.29	43748	5469
	JMKTG220	7	67.01	9.57	132357	18908
	OTHERS	21	89.95	4.28	100880	4804
PLANNING	OTHERS	17	43.00	2.53	27479	1616
PRODUCTION	JPROD200	12	80.47	6.71	107271	6939
	JPROD500	7	170.00	24.29	69020	12717
	JPROD650	4	58.35	14.59	91561	22890
	OTHERS	24	142.18	5.92	108352	4515
SYSTEMS	JSYS525	4	38.47	9.62	22519	5630
	JSYS620	4	24.62	6.15	39212	9803
	JSYS700	4	41.36	11.84	41780	10445
	JSYS850	4	49.67	12.42	40256	10064
	OTHERS	17	33.88	1.99	114291	6723
ALL JOBS		222	1440.00	6.49	1366608	6156



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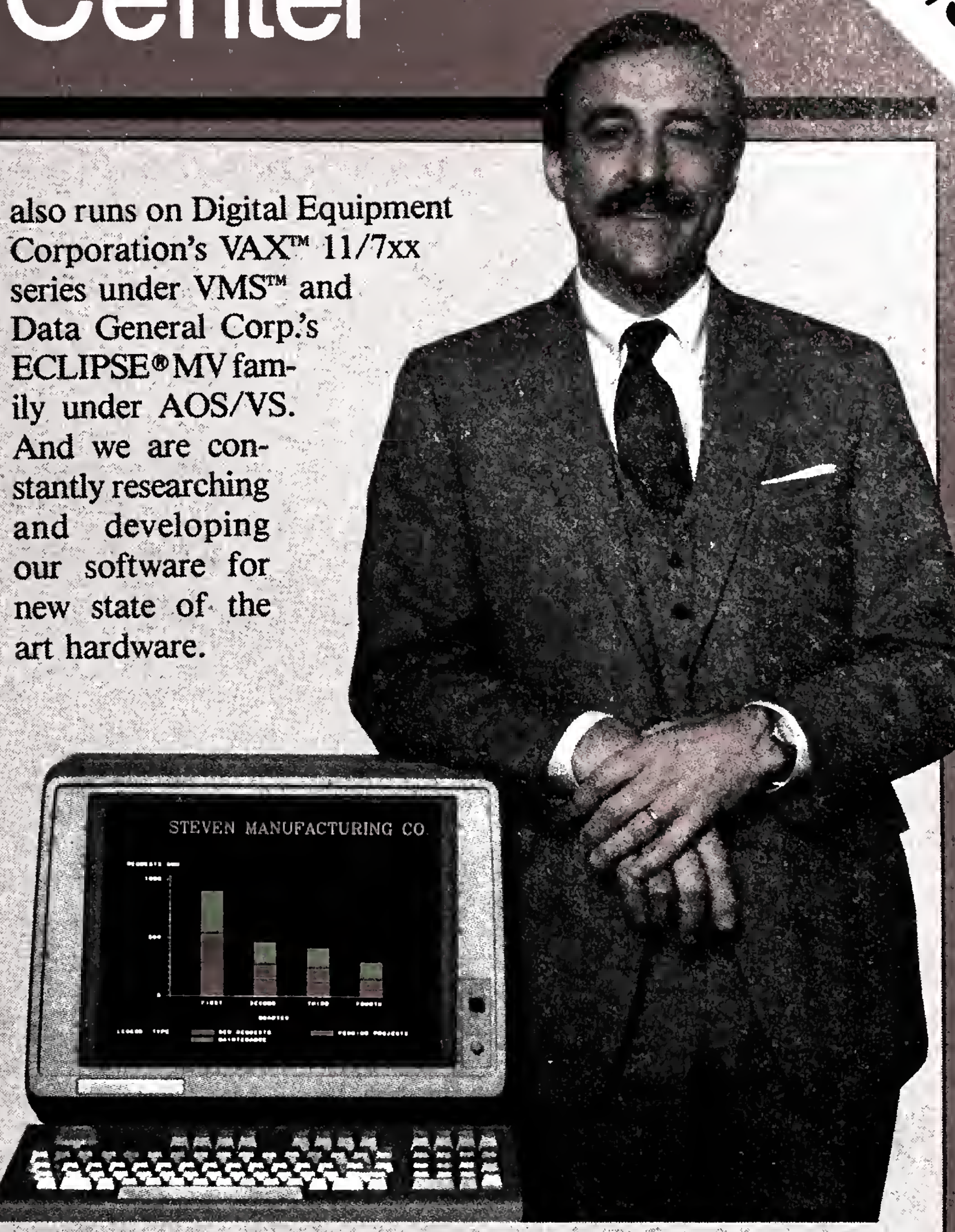

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UFO, CA-Universe, TIF, Umbrella, ADF, CSP, Gener/Ol, Info, Mark V, Linc and Mimer support substantially fewer integrated components.

Ramis II provides 28 integrated functions accessible by a user within a common set of interfaces. Focus, Nomad2, Natural, ADS/On Line, Mantis, Ideal and Application Factory provide progressively fewer integrated functions.

Automated development

The most important new trend in technology is the replacement of manual development techniques with automated ones. There are major differences between the two:

■ Manual techniques are incapable of providing the 10:1 productivity increase that is required and must be replaced by automatic techniques wherever possible.

■ Structured techniques, such as those advocated by Edward Yourdon, Larry Constantine, Chris Gane, Trish Sarson and others provide only a small improvement in productivity over conventional manual techniques and should be replaced by automatic techniques.

■ Automation of manually oriented conventional or structured techniques is not productive and should be avoided.

■ Automated tools require entirely new methodologies.

■ Automated tools utilizing new methodologies are available now and should be considered for use for all new applications.

> ”
>
> *Structured techniques, such as those advocated by Edward Yourdon, Larry Constantine, Chris Gane, Trish Sarson and others provide only a small improvement in productivity over conventional manual techniques and should be replaced by automatic techniques.*

Automatic code generation is an integral part of automated development techniques. The nonprocedural (that is, noncoding) components of full-function fourth-generation languages make it easy to specify to the computer what the user wants to do. Using most of the leading fourth-generation languages, it is relatively easy to formulate a query, specify a report, plot a graph or analyze data using statistical tools. Most of these tools also contain user-friendly interfaces to define data variables, data attributes, screen layouts, menus and interactive dialogues.

These nonprocedural components of fourth-generation languages may be used effectively by non-DP professionals to access data, generate simple data entry and editing transactions and produce reports or graphs. These same nonprocedural components may be put to work by experienced systems analysts to build prototype systems that may be demonstrated for the end user. All these tasks may be performed without writing a line of procedural logic.

The procedural component of full-function fourth-generation languages is used to specify the specialized logic required in most applications. The procedural language used by fourth-generation languages is a high-level programming language that includes I/O statements, loops, conditions, control statements, arithmetic and assignment statements.

A typical fourth-generation procedural language is similar to Cobol but of a higher level. For some fourth-generation languages, such as Focus, Nomad2, Natural, Ideal and Application Factory, the procedural language is rich enough in functions to replace Cobol for most business applications. Less richly endowed procedural languages require escapes to Cobol, Fortran, PL/I, APL or assembler to implement specialized procedural logic.

A problem for all fourth-generation languages is that the specification of procedural logic is a slow process compared with the specification of nonprocedural functions, such as the generation of screens, reports, graphics and on-line transaction dialogues. Applications requiring a relatively small amount of specialized procedural logic can be developed 10 to 15 times faster than with Cobol. Most end-user-driven information processing applications fall into this category, since they utilize primarily nonprocedural functions.

Unfortunately, most real-world applications developed by DP professionals require a great deal of procedural logic. The logic is used to specify detailed processing functions, utility functions, error handling conditions, highly customized formatted reports, specialized interfaces and so on. In one large application, for example, 15% of the total effort was devoted to the nonprocedural development of screens and reports. However, 35% of the total effort was consumed in coding utility routines using the fourth-generation procedural language.

In general, if an application requires a substantial amount of procedural logic, the overall productivity improvement provided by the fourth-generation language will be reduced.

Various techniques have been used by different fourth-generation

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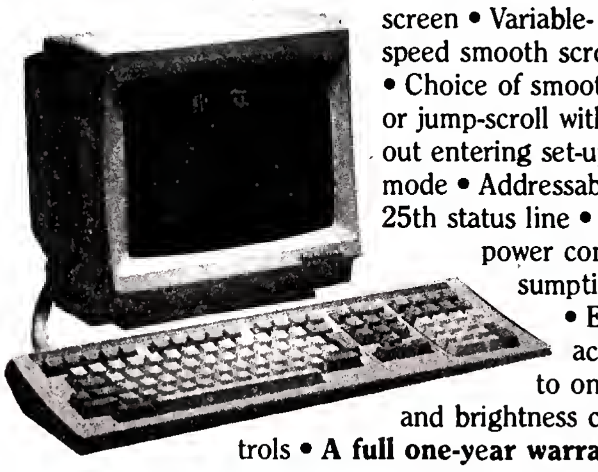

Design
The ERGO 320 is ergonomically designed and housed in an attractive, compact case with an adjustable monitor and smaller footprint than the DEC VT220. The detached, low-profile keyboard, is shorter than the DEC VT220 keyboard, and has an easy-tilt adjustment to provide ease of use for **all** users.

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Upgradability. The ERGO 320 can accept an optional graphics board ($745) which will perform all Plot-10 and ReGIS functions. The graphics board, which turns an ERGO 320 into an ERGO 340, can be added to existing ERGO 320s. The small footprint is maintained when adding graphics to an ERGO 320 but must be forfeited when purchasing a VT240. **Fast, too.** In addition, our graphics offers significant speed advantages over a VT240— as much as **seven times** faster. (See an actual comparison above.)

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language products to minimize the time required to specify procedural logic. Both ADS/On Line and Application Factory encourage the specification of small modules of logic tied directly to specific events in the application. In Application Factory, logic modules may be attached to screen events, report events, data base access events, menu events or data entry events. The effect is to eliminate the need for large blocks of procedural code and to simplify maintenance.

Action diagramming techniques have been used recently to simplify the specification of procedural logic. Action diagrams clearly show the logical structure of the procedural code. To date, Application Factory is the only fourth-generation language tool that supports action diagramming techniques.

Well-designed languages offer the following:

- Avoidance of unnatural, computerese syntax.
- Use of natural English wherever possible.
- Choice of multiple command interfaces geared to different levels of user experience (that is, choice of natural English, two-dimensional menus or near-English command syntax).
- User-seductive interaction with the computer.
- Adequate menus, prompts, Help and self-teaching facilities.
- Rapid, on-line interaction with displays.
- Two-dimensional display dialogue.
- Use of overlaid display windows.
- Use of graphics symbols (icons).
- Use of a mouse to select commands, menus, scroll and edit functions.
- Minimal keyboard interaction.
- Intelligent default options.
- Simple subset of operations that can be learned in one or two hours.

Most fourth-generation language tools force users to learn a rigid set of commands or statements, which must be entered precisely in order to avoid syntax errors. Very few tools offer user-friendly human interfaces.

Apple Computer, Inc.'s Macintosh and Lisa may serve as a standard against which the human interfaces of fourth-generation languages are compared. No existing fourth-generation language even approaches this standard yet.

Focus and Ramis II provide the user with a choice of interfaces including natural English, menus or command syntax. Natural, Mantis and Ideal offer a more limited choice of menus or commands. This range of choices makes it possible for non-DP professionals to use a subset of the functions provided by the tool. The end user may start with a simple subset of the functions that can be learned in two hours or less. Once the user has become completely familiar with the subset, he can progress to a wider range of functions.

Focus incorporates a well-designed, menu-driven human-interface called Tabletalk, which encourages the user to move from simple to more complex functions. Tabletalk provides a user-friendly interface for queries and reports. All Tabletalk functions are selected from menus, which minimizes errors and eliminates the need to learn a command language. In response to menu selections, the Focus command that corresponds to the selected operation is displayed in a separate window on the bottom of the screen. This window can be used as an effective self-teaching aid for the more powerful Focus command language.

Almost all fourth-generation languages require the user to enter commands according to a precise syntax. A small number of tools, including Tell-A-Graf, permit the user to enter commands in a flexible, near-English syntax. Many versions of the same command are acceptable to the system.

Natural English language processors are beginning to be used in fourth-generation languages. Both Focus and ADS/On Line incorporate an interface to the query and report generation language Intellect. Ramis II is the first fourth-generation language to incorporate a fully integrated natural language processor called Ramis II English.

Although the range of applicability of natural English processing remains relatively narrow, the potential is enormous. Currently, its use provides an easy first step in computer literacy for decision makers who do not have

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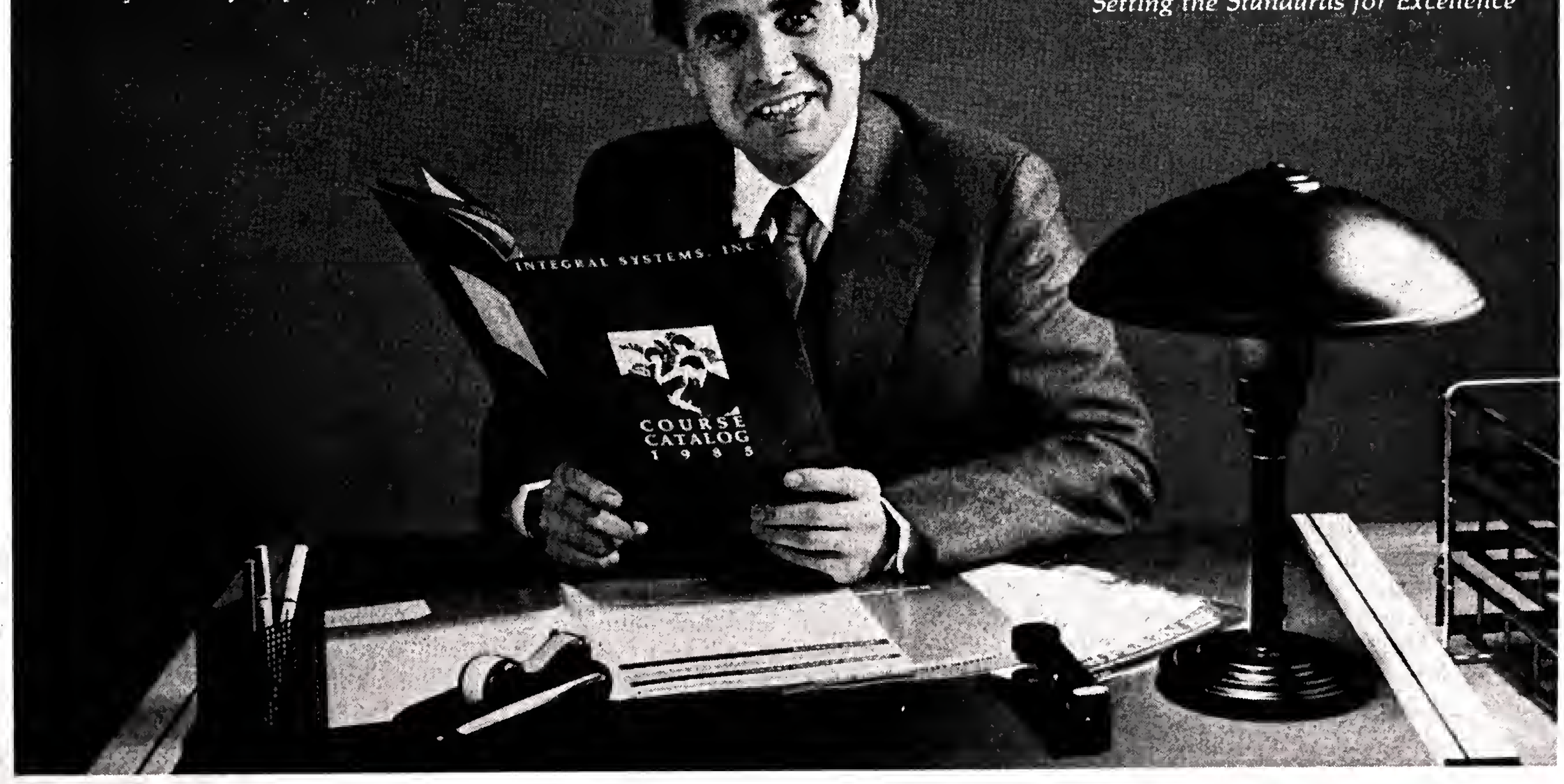

> *Apple Computer's Macintosh and Lisa may serve as a standard against which the human interfaces of fourth-generation languages are compared.*

the time or inclination to learn an alien command syntax. Ultimately, the more widespread use of natural English processing should eliminate the need for rigid command languages.

Support for personal computers may become one of the most important factors to be evaluated in selecting one fourth-generation language over another.

The provision of fourth-generation languages on a personal computer greatly enhances the language's value to the user. Applications may be developed or run interchangeably on a personal computer or mainframe. Data may be accessed from the mainframe and processed on the personal computer. End users may use fourth-generation language functions on the personal computer to progress step by step toward computer literacy.

Currently, only four fourth-generation language tools are available in both a personal computer and mainframe version. PC/Focus is available on an IBM Personal Computer XT or AT. Ramis II/PC is available on the XT/370. Nomad/PC is available on the XT/370. Cricket (the Personal Computer version of Mantis) is available on the XT/370.

Improvements to fourth-generation languages will likely occur in the following directions:

Integration and automation.

- Wider use of structured constructs.
- Use of action diagrams to simplify the specifications of procedural logic.
- Provable specification techniques.
- Continued evolution to relational data bases.
- Integration of application packages with fourth-generation language.
- Integration of decision support tools with fourth-generation language.
- Definition of standards for data representation.

Human factors.

- Elimination of alien, nonhuman syntax.
- Use of natural English for command languages.
- Use of human interfacing techniques currently available only on the Macintosh and Lisa.

Support of personal computers.

- Evolution of more powerful local workstations supporting the needs of knowledge workers.
- Subsecond response time.
- Very fast interaction with system (for example, 400 interactions per hour).
- High-speed interface to distributed data base.
- Transparency of data residence.
- Widespread use of personal computers for information processing, application development and management of a local data base.

Information centers.

- Massive growth in support of end-user computing and knowledge workers.
- Reduction in the number of tools used in information centers and an increase in their power.
- Consolidation of fourth-generation language development methodology based on advanced prototyping techniques.

About the author

Pieter Mimno is president of Technology Insight, Inc. of Marblehead, Mass., which publishes The James Martin Report on High-Productivity Languages. *The Martin Report is a new information service that provides continually updated information on high-productivity tools. Editor and co-author of The Martin Report, Mimno has 24 years of experience in the computer field and does independent consulting.*

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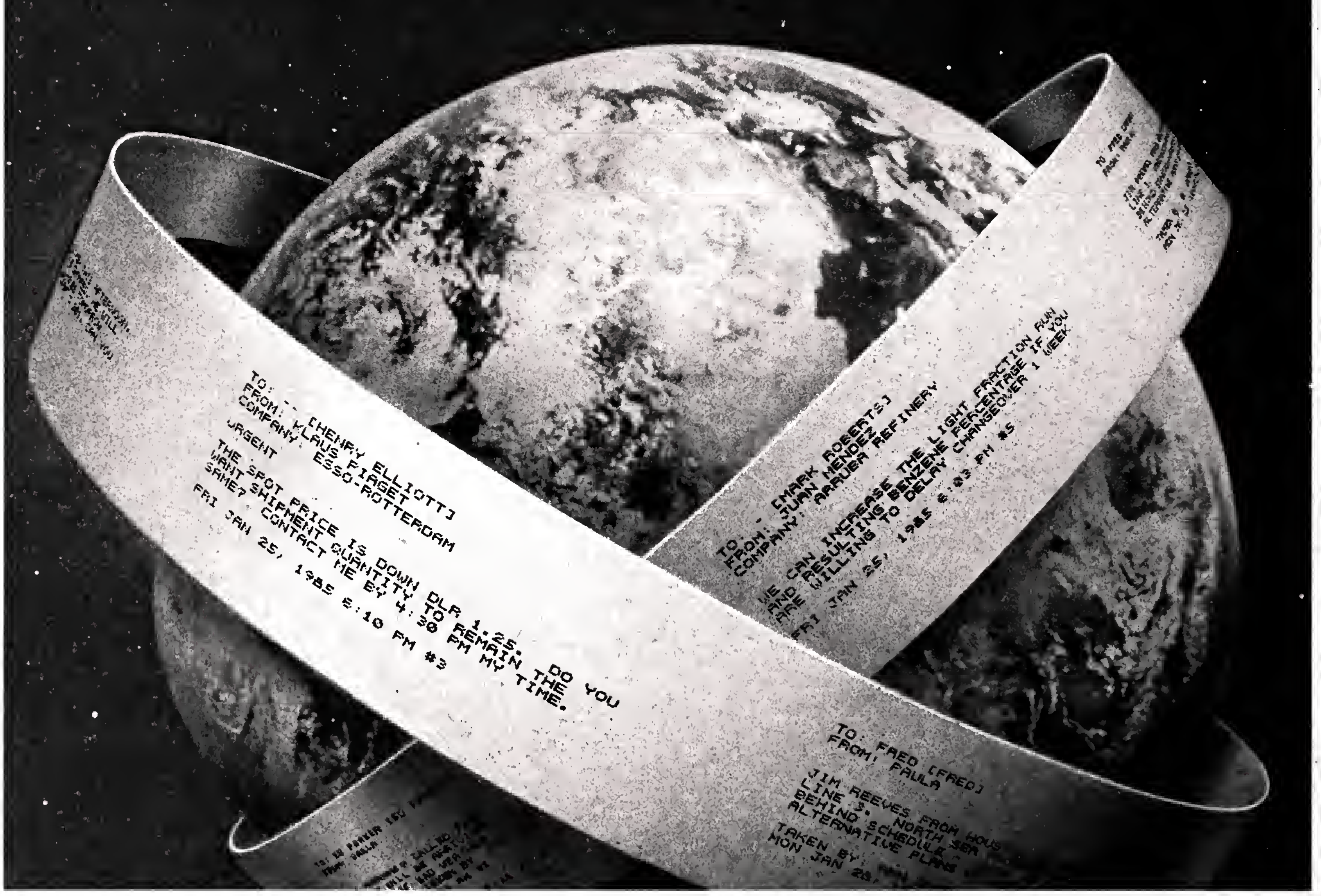
TO: - [HENRY ELLIOTT]
FROM: KLAUS PIAGET
COMPANY: ESSO-ROTTERDAM
URGENT
THE SPOT PRICE IS DOWN DLR 1.25. DO YOU WANT SHIPMENT QUANTITY TO REMAIN THE SAME? CONTACT ME BY 4:30 PM MY TIME.
FRI JAN 25, 1985 6:10 PM #3
TO: - [MARK ROBERTS]
FROM: JUAN MENDEZ
COMPANY: ARRUBA REFINERY
WE CAN INCREASE THE LIGHT FRACTION RUN AND RESULTING BENZENE PERCENTAGE IF YOU ARE WILLING TO DELAY CHANGEOVER 1 WEEK
FRI JAN 25, 1985 6:03 PM #5
TO: FRED [FRED]
FROM: PAULA
JIM REEVES FROM HOUS LINE 3. NORTH SEA BEHIND SCHEDULE - ALTERNATIVE PLANS
TAKEN BY
MON JAN 28

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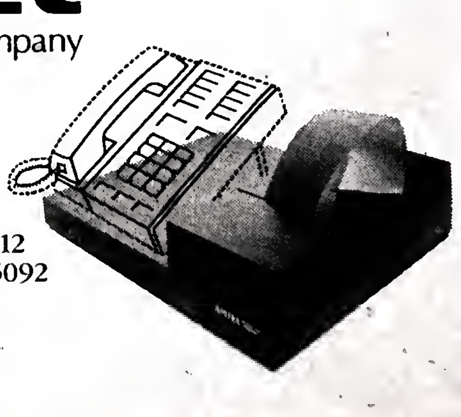

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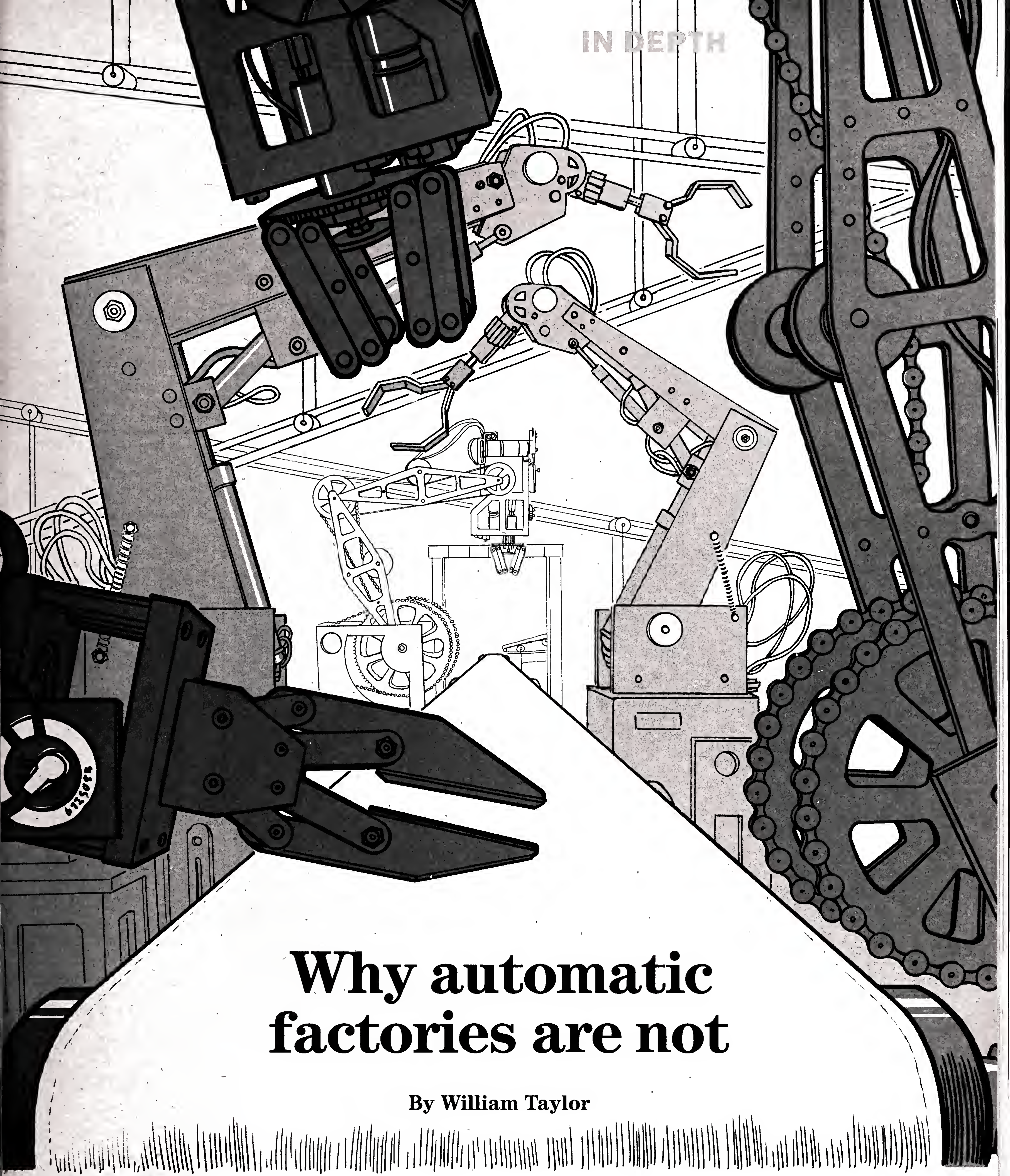

Why automatic factories are not

By William Taylor

After years and years of coaxing automatic factories to work about one-tenth as well as they ought to work, we realize we have been going about it wrong. The problem is not with the technology — that is well understood. We have trouble because we do not have the right mental model of our factories. Automatic factories are easy for computer systems folk to build but hard for factory folk to use.

Most of us understand the factory floor. Programmable controllers are wired to about 200 I/O points each. Input points tell the programmable controller what is going on, and the controller uses output points to influence the world. Programmable controllers support very few kinds of I/O points. Contacts let the controller read switches or turn things on and off. Analog modules let the controller read and set voltages. Register modules read and write numbers. Exotic modules send pulse trains to servo motors; and that is about it.

Things are stable at the top, too. Factory host computers handle order entry, factory scheduling and material requirements planning in large companies. That is why requests for proposal (RFP) for factory automation say that data from programmable controllers must get to the factory host or computers.

This situation leads to the triangular diagrams we see in factory management magazines. The bottom layer shows programmable controllers running equipment as far as the eye can see. The top of the triangle is a mainframe. We computer builders have a simple task. For our first trick, we let the computer know what is

ILLUSTRATION BY DAVID J. SULLIVAN

going on in the factory so it can tell management. For our next trick, we let the computer pass management's orders back to the programmable controllers. If we boil factory RFPs down, that is what the users are trying to do. Imagine the chairman steering a multibillion-dollar corporation from a terminal attached to some master computer, and you have the idea.

The computer knows what is on order and what is in inventory, with a time lag depending on how fast data is entered. If the system knew what was happening from moment to moment, it should be able to run the plant. That is the theory, anyway.

The problem is, there is too much going on for mainframes to make sense of it. Each programmable controller has about 200 points, and there may be 300 or 400 controllers in the factory. That is far too many bits per second for a computer to cope with. For instance, the RFPs call for us to put something in the triangle that summarizes the data. The computer does not need to know that limit switch No. 43 on programmable controller No. 146 has closed — it needs to know how many pistons are being made, and if not, why not.

Tying programmable controllers to the computer won't work — it would be swamped with too much data. We have to put something in the triangle that gets data from programmable controllers and turns it into information for the computer. The data rate must be reduced so a computer can handle it.

The big picture

There are more ideas for filling the triangle diagram than there are equipment vendors, but they boil down to the same thing: We must put a data collector over the programmable controllers. Whenever we get too many data collectors, we put in another layer. Finally, the top layer talks to the computer.

It is hard to make money selling data collectors, because there is only one data collector for every 16 to 32 programmable controllers. If there are 300 controllers, there may be 10 or 11 data collectors. Programmable controllers we readily understand; however, data collectors are a nightmare.

In short, the money's in programmable controllers, and the headaches are in data collectors. Vendors would rather not discuss data collectors at all, but programmable controller buyers demand that someone wire them up. Vendors are hoping someone else will sell data collectors, so they can concentrate on the more profitable controllers.

The little picture

Never mind that no one knows how to build a data collector. Assuming we could buy them, how would we use them? Well, they collect data from programmable controllers and pass summaries up. Data collectors get orders from on high and distribute them to programmable controllers. We establish communications paths by wiring the collectors together, assigning them addresses and building address tables.

We build a chain of command by wiring programmable controllers to the data collector from which they take orders. We hook programmable controllers to the nearest data collector because it saves wire. We run local-area networks so that they cover a reasonably compact area of the factory regardless of what the programmable controllers in that area are doing. Communications paths are laid out geographically.

That is where the famous triangle diagram comes from. We have programmable controllers at the bottom, running machines that make money. We wire programmable controllers that happen to be near each other into a data collector.

Next, we string a factorywide communications cable so that data collectors can communicate with their bosses and so on up to the computer.

This is a very seductive theory. It feels right that data should flow neatly to the top of the hierarchy and turn into orders that flow neatly down.

The trouble is, that is *not* how a factory works. No matter how we label the boxes, this is the same old army hierarchy. An army hierarchy is optimized to get a million men moving in the same direction with a few hours' notice, but we seldom have to do that in factories.

"HE JUST FOUND OUT THAT OUR LOCAL AREA NETWORK DOESN'T MEET OUR PERFORMANCE NEEDS."
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Figure 1 shows the classical factory automation block diagram. Programmable controllers handle equipment on the factory floor. Programs in the controller convert contact closures into process information and report to data collectors. Data collectors gather information from many programmable controllers and pass it up. Eventually, enough summary data gets into the host computer that the computer knows what is going on in the factory.

Management gets factory status information from the host computer. Management orders are relayed down through data collectors to programmable controllers. This is how the factory is controlled. There are problems with this approach because data flow does not correspond to process flow.

The workings of a factory

There are two basic styles of factory operation — production-push and demand-pull. U.S. factories use production-push. We run our machines flat out, building up stock for the next process. We buffer each process so that we can keep the factory running, even if many of the machines are not.

The Japanese use demand-pull. When they want something, they send a message to the upstream processes asking for parts. These processes either supply the parts or ask further upstream. That is the idea behind the "just-in-time" approach — put off making something until it's needed.

Whether we think of a factory as production-push or demand-pull, the fundamentals are basically the same. It takes so many widgets to make a wadget. It takes so many wadgets to make a frammis and so on. Inventory carrying costs and quality are affected by whether we push raw materials in the front or pull finished products out the back; but either way, we finally produce something to sell.

A factory makes and combines parts. Raw materials are pummeled into parts, which go into bigger parts. Production people think of a factory as a river flowing from left to right. Raw materials start at the smallest branches on the left. Streams combine as parts are assembled. Dams stop the flow to build up buffer stock. More and more streams come together, and we finally get a finished product out the door. A factory is a real-time parts implosion system. Instead of exploding products into parts as a parts explosion program does, a factory *implodes* parts into products.

Where designs go wrong

Computer types have been misled because a parts implosion tree looks like the computer tree, only turned on its side. After all, raw data comes off the floor into programmable controllers. The controllers run processes and pass summaries up. The information streams converge at the computer. This gives us a picture of current events in the factory. Combining data into information does not seem very different from combining raw materials into products.

We have found, through bitter experience, that the factory tree and the process tree do not relate well. A geographic chain of command scatters data about a process across several data collectors, and we cannot find out what is going on. Consider raw materials entering a factory. They flow to machining stations managed by programmable controllers. Machining stations are close together, so machining programmable controllers are wired to the same data collector. The collector knows about machining, but it does not know where a part comes from or where it goes.

The process tree runs across, and the computer tree runs up and down. Each vertical data collection branch crosses many process branches instead of running along one process. Each data collector knows about parts of many different production paths, but it does not know much about any production path. Data collectors are unable to tell much about the overall process, because each has only bits and pieces of the big picture.

Suppose, for instance, a data

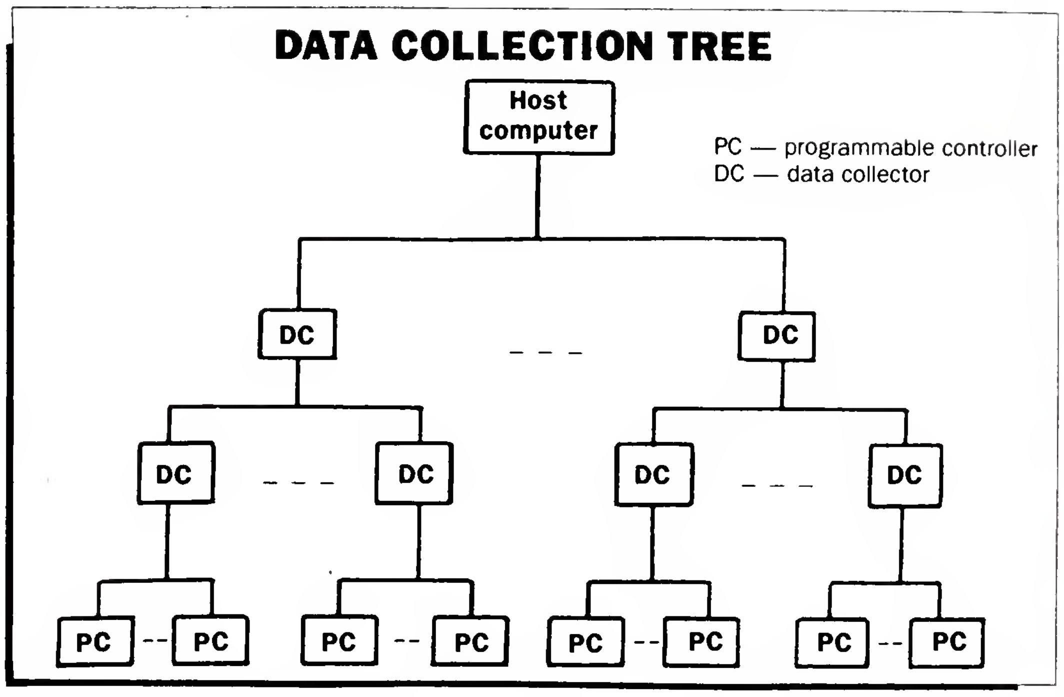

Figure 1

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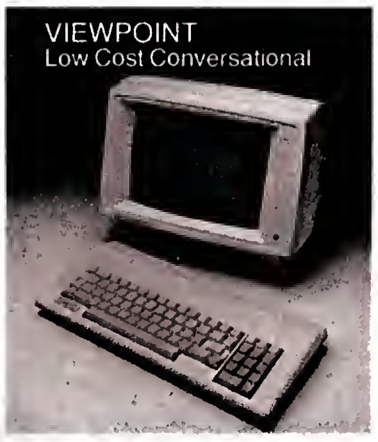

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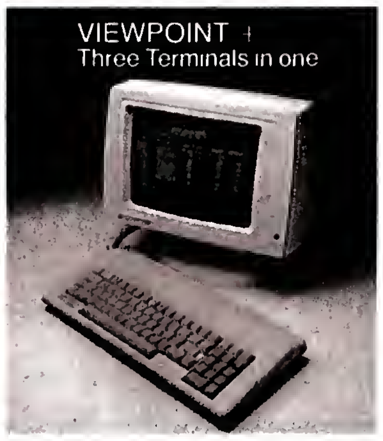

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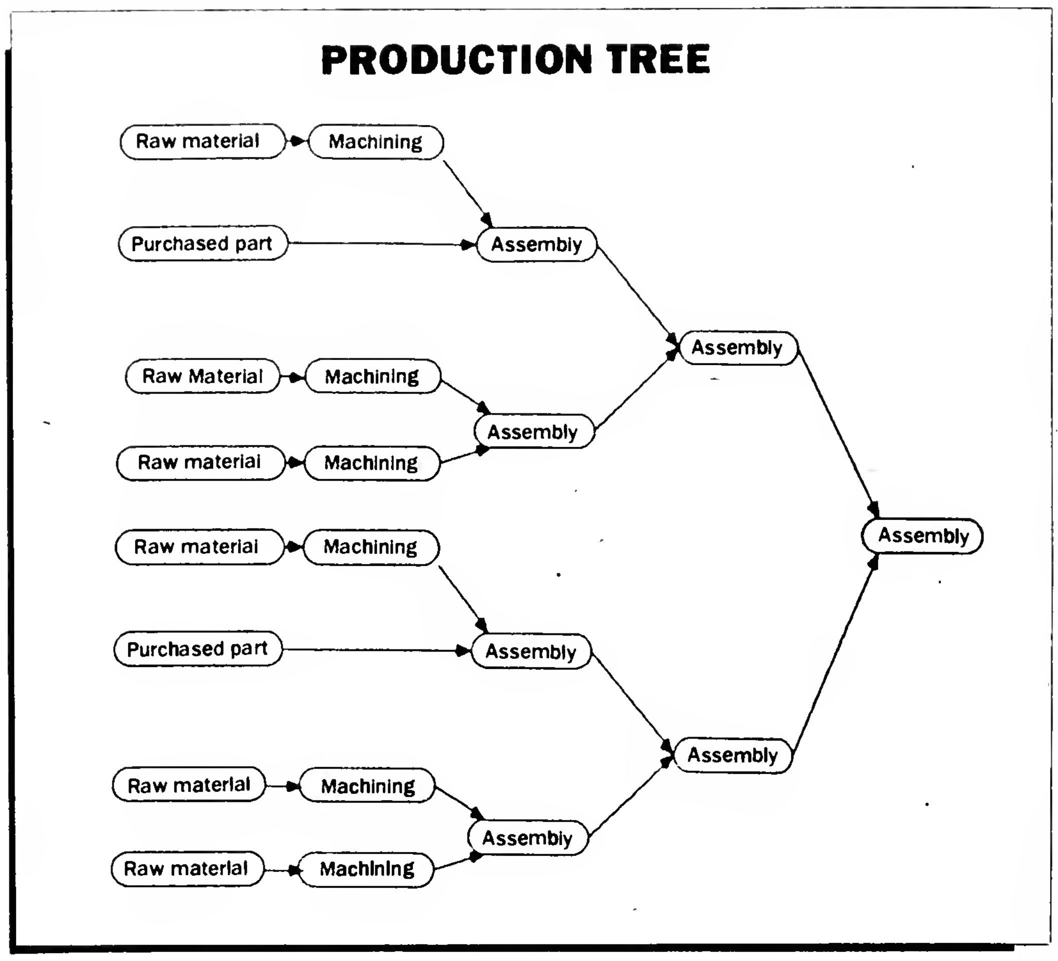

Figure 2

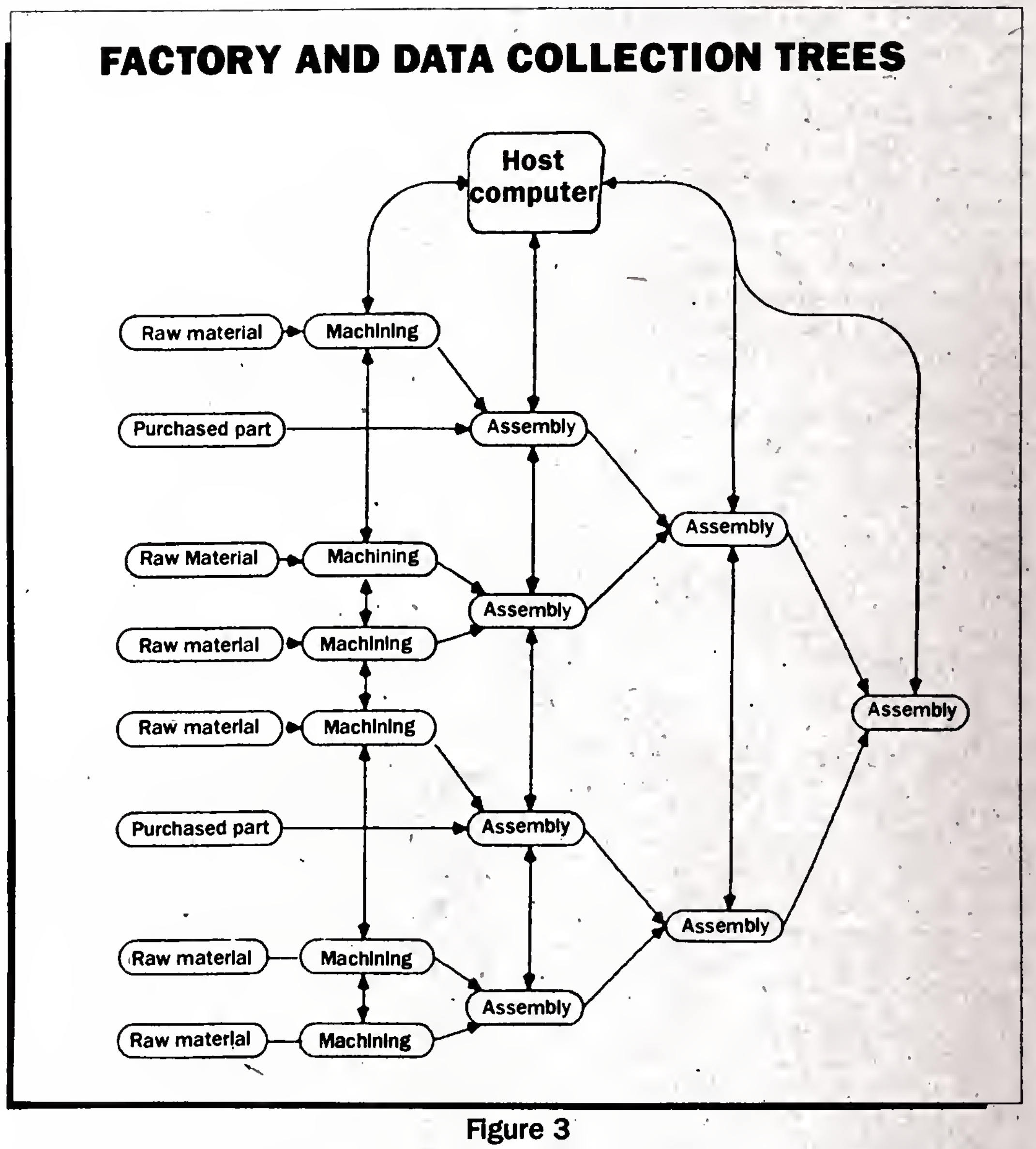

Figure 3

collector states that programmable controller No. 432 is stopped. It does not know whether it stopped because it is broken or if the next programmable controller is stopped and the buffer is full. The data collector knows all about programmable controllers near controller No. 432. It does not know about the process that controller No. 432 is trying to implement because it is not wired to its programmable controllers. They are not part of its chain of command.

Who has the big picture?

The computer at the top should know if we are making widgets — summaries from data collectors are processed there. A computer could match reports from programmable controllers with process information from parts explosion data, figure out how parts of the process relate and provide overall status information. That is a computer builder's approach to factory automation — get the data into the system and let it tell us what we need to know. This also makes money for the computer manufacturer. It takes a big mainframe to map a process flow tree going left to right into a data collection tree running up and down.

A factory host could describe the process tree to the data collectors. Then a collector could give process status, provided data collectors swapped information or got it from the computer. This strategy makes data collectors cost more — because they have to store more data. Instead of just worrying about subordinate programmable controllers, they get process flow from computers and status from other data collectors. Data collectors get so big that nobody can afford them or write the software that they need.

We can solve this problem without expensive data collectors or a large computer by arranging the chain of command to follow the process instead of the floor layout. Thus, put a data collector wherever parts come together. The data collector gathers data from programmable controllers downstream and sends reports to data collectors upstream. Each data collector knows how things are going in the process.

Figure 2 shows what happens in a factory. Parts flow through the process from left to right, as described earlier. Each machining and assembly step is controlled by a programmable controller. Buffers between process steps hold parts. Factory management is interested in how the process is going. Branches of the process tree wander all over the factory, depending on how the plant has been laid out. Communications systems in factories collect data geographically, with little regard to the process. Each data controller knows about an area of the factory, not a part of the process.

It is the interaction between the factory tree and the data collection tree that causes trouble (see Figure 3). In this example, one of the data controllers knows about all the machining stations; another data controller monitors some of the assembly stations; and the third data controller monitors the rest. The information about any branch of the process tree is spread through all of the data controllers because the data tree and the factory tree run in different directions.

This arrangement is simple but wastes data collectors. Each one could handle data from eight to 16 programmable controllers. There are very few places in a factory where six parts converge.

If we put data collectors where only three or four parts come together, they get data from only three or four programmable controllers instead of eight or 16, and we need

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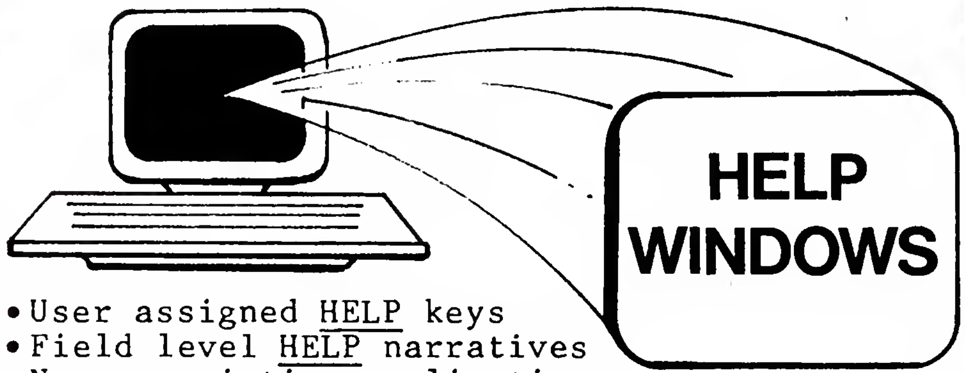

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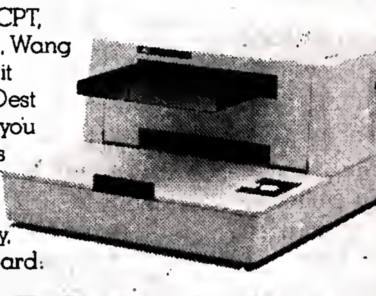

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more of them to cover the factory.

We could put data collector-like functions into remote I/O for programmable controllers. The simplest scheme is to build an I/O module that swaps eight or 16 bits between two programmable controllers. The module would make eight outputs from one programmable controller look like inputs to the other programmable controller and vice versa. Company electricians could write ladder programs that would communicate via these bits.

Given a remote I/O link from each programmable controller to its upstream controllers, each one can tell how well it is being fed by upstream processes. We follow a process by wiring programmable controllers together and do not use data collectors at all. This changes the problem from data management and networking, which we do not understand, to remote I/O and process layout, which we do understand. Factory people understand remote I/O and do not understand networks. They will be happier if remote I/O modules replace networking.

In effect, sharing information between programmable controllers via remote I/O gives us distributed control. Each one controls its process and shares status and summary information via what it thinks is remote I/O. This lets us share information without the grief of going to full networking.

Local-area networks

But, some object, even if each programmable controller knows what its downstream and upstream colleagues are doing, we still need networks to download programs to personal computers. What about flexible manufacturing? If remote I/O wiring is specific to a process, we have to make drastic changes when we change products. Since we need networks anyway, there is no reason to use fancy remote I/O to share information — we should be able to use the network for that.

This argument would be stronger if networks worked the way a factory does. The problem is, local-area network theory is based on the telephone system, and factories operate on the bulletin board system.

Networking people have defined seven layers of protocol which, theoretically, let any computer talk to any device. Whenever a computer needs to talk to a robot, for example, the computer asks the network to set up a virtual circuit to the robot. The virtual circuit makes the network act as if there were a private wire directly between the computer and the robot.

It would cost too much to run wires between each pair of machines that might have to talk to one another, just as it would be prohibitive to run wires from every telephone to every other telephone. The network makes one shared wire act like many private wires.

Once a circuit is established, the computer can talk to the robot as if it were a normal peripheral. The network establishes the connection, sends information in the computer's format to the robot and changes it to the robot's format. We pay for this flexibility with complex networking boxes. When customers buy a network of boxes with the seven protocol layers integrated into them, they get integrated grief, too.

Problems with networks

It takes a lot of software to implement the seven layers, some of which are still poorly defined. Disks do not

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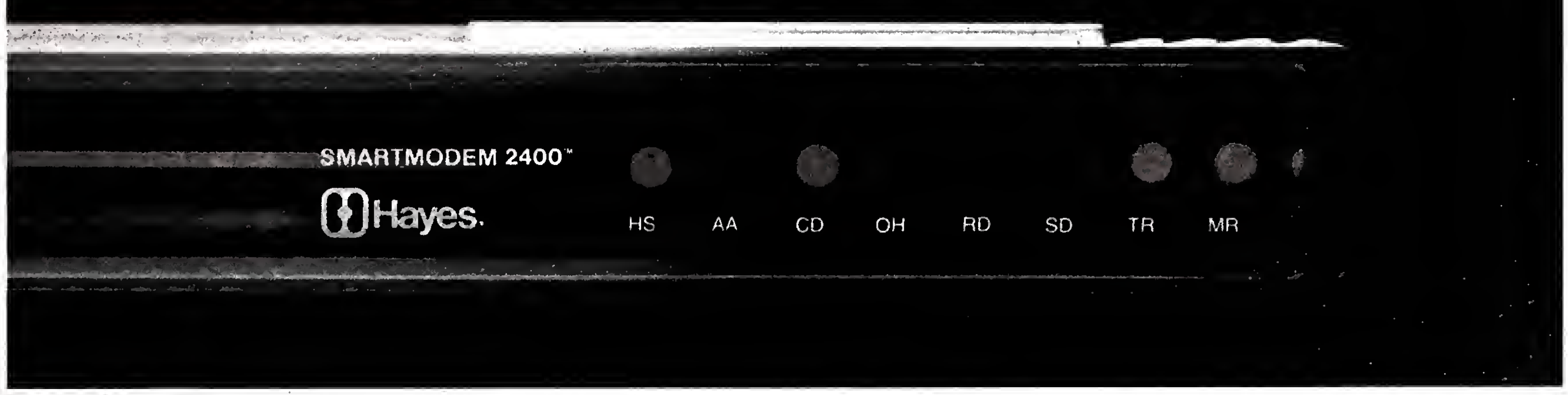

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last long in factories, so vendors put protocol software into read-only memory (ROM). In order to save distance on the main communications wire, the boxes are placed up near the ceilings of factories, where maintenance people cannot read the address switches or error indicators.

This "ROM-in-the rafters" approach leads to high maintenance costs. Putting the boxes up in the first place and getting all the address switches set correctly is a challenge. It's as though the faucets in a plumbing system had address switches. If the address is wrong on any faucet, all of them leak. How do we find the one with the wrong setting?

These problems are being solved, but even when the seven layers arrive in all their glory and we can quit climbing ladders to replace ROMs, we still have problems.

Think about the virtual circuit between the computer and the robot controller. The program in the computer has to know that a circuit must be attached. There are usually operating system calls to establish and operate such a link, but applications programs have to know about them. Current definitions of the protocol between networks and computers forces application programs to know the device names by which links are established.

Computerized factory control

Think about what factory control systems should do. We want the computer at the top of the factory to take current orders, inventory and machine status into account and operate the factory in the most profitable manner at all times. As we reduce work in process and go to just-in-time systems, such control becomes increasingly critical.

This does not sound too difficult — we have order entry systems that operate in real-time, and we have materials requirements planning (MRP) programs. All we have to do is couple the MRP system to the order entry system, give it access to current factory status, and we're home free, right?

Not quite. MRP is a batch program. It was not designed to interact with real-time factory data. It reads files representing factory status at some point in time and generates a production schedule that is supposed to be followed for a while. MRP programs have to be completely rewritten in order to tune factories in real-time.

We all know how expensive it is to write large programs, such as full-house MRP systems. Making MRP couple to a huge number of virtual channels in order to find out what every machine in the factory is doing is going to be even more difficult.

Well, many say, nobody in his right mind would do that. Everybody knows we write a data acquisition program that sits in front of MRP and any other program that needs to know what is happening. A data acquisition program polls all the personal computers over the network and maintains an up-to-the-minute image of factory status. Any programs that need this data look on the disk where the data acquisition program put the data. In effect, the data acquisition program makes the factory look like a relational data base, which MRP accesses to learn what the factory is doing.

This situation shares the cost of the data acquisition program between programs that need information, but application programs still have to go through complicated gyrations to get information. Instead of issuing network incantations, programs retrieve information by issuing data base incantations. This may be easier, but programs will still be more expensive than we would like them to be.

Not only that, the data acquisition program is a very complex program. It establishes virtual circuits to every device, polls them periodically and averages information. We have to assign addresses to each network box and keep lists of everything attached to each box. This information needs to be kept current and made available to the data acquisition program. In effect, we have centralized all of the complexity in one program.

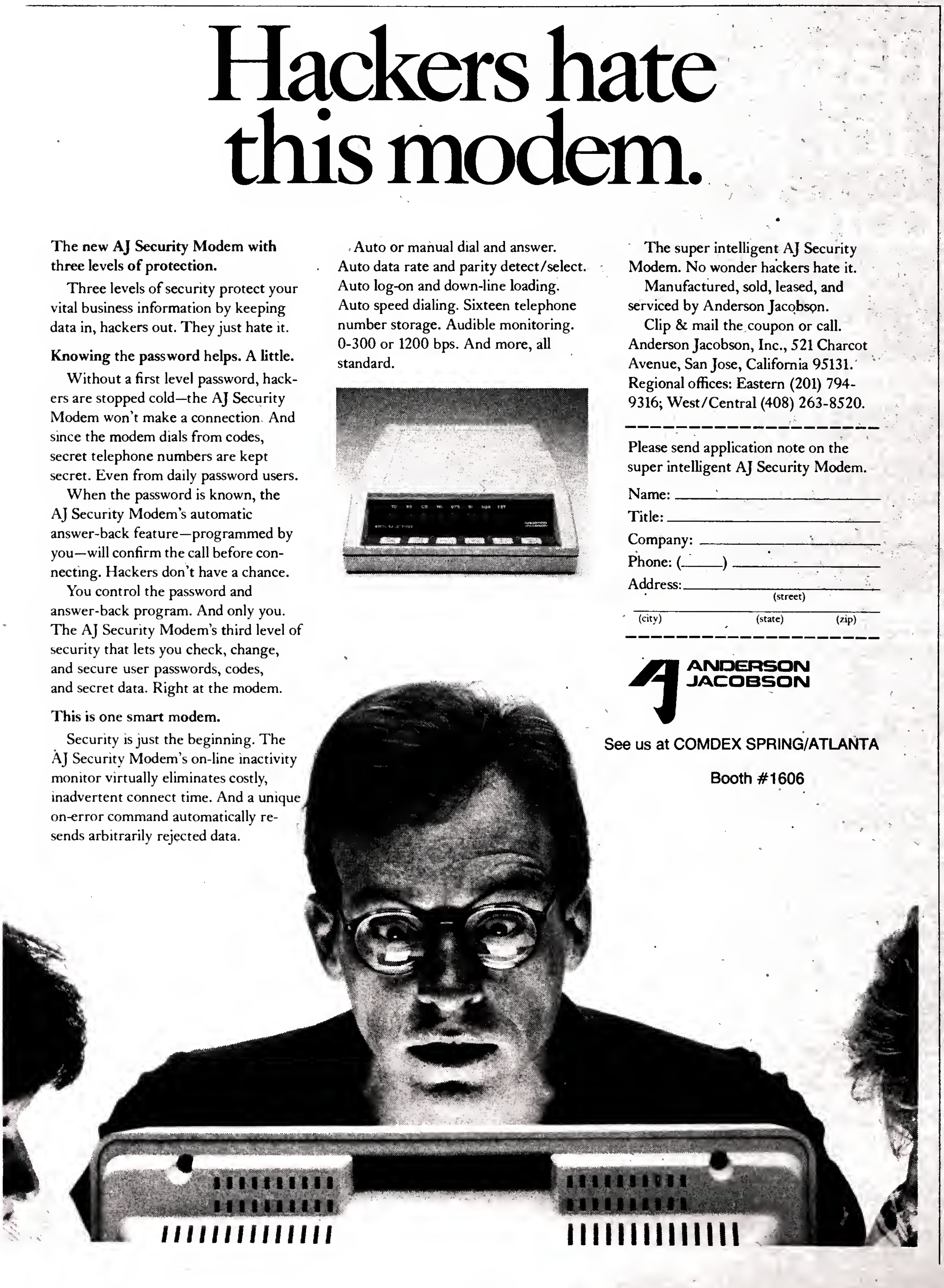
Telephone analogy

Network systems that let us establish virtual circuits are like the telephone system. Provided our computer knows the robot's name, it can ask the network to look up its address to establish a link to the robot and talk to it. This is like telephone calling — the network implements a large number of two-way conversations at once. The trouble is, factory information does not flow along two-way paths, where information is consumed by one user. Factories operate on the bulletin board system, where information is posted so that all interested parties can read it.

Machine operators generate shift reports. Foremen summarize reports from many machines into a department report, and department reports are summarized for the factory manager.

People use information from each machine in different ways. The plant manager can focus on a particular machine, if need be. Machine operators communicate with maintenance and with operators of adjacent machines, sometimes without knowing who the others are.

Figure 4 on ID/36 shows part of the process tree from the previous figure. Some of the problems are eliminated if programmable controllers share status information via remote I/O. Swapping eight to 16 bits of data gives a programmable controller information about upstream and downstream processes. Plant electricians can put in status swapping using conventional ladder programming. This reduces networking, which is not well understood, to standard ladder programming, which is well understood.



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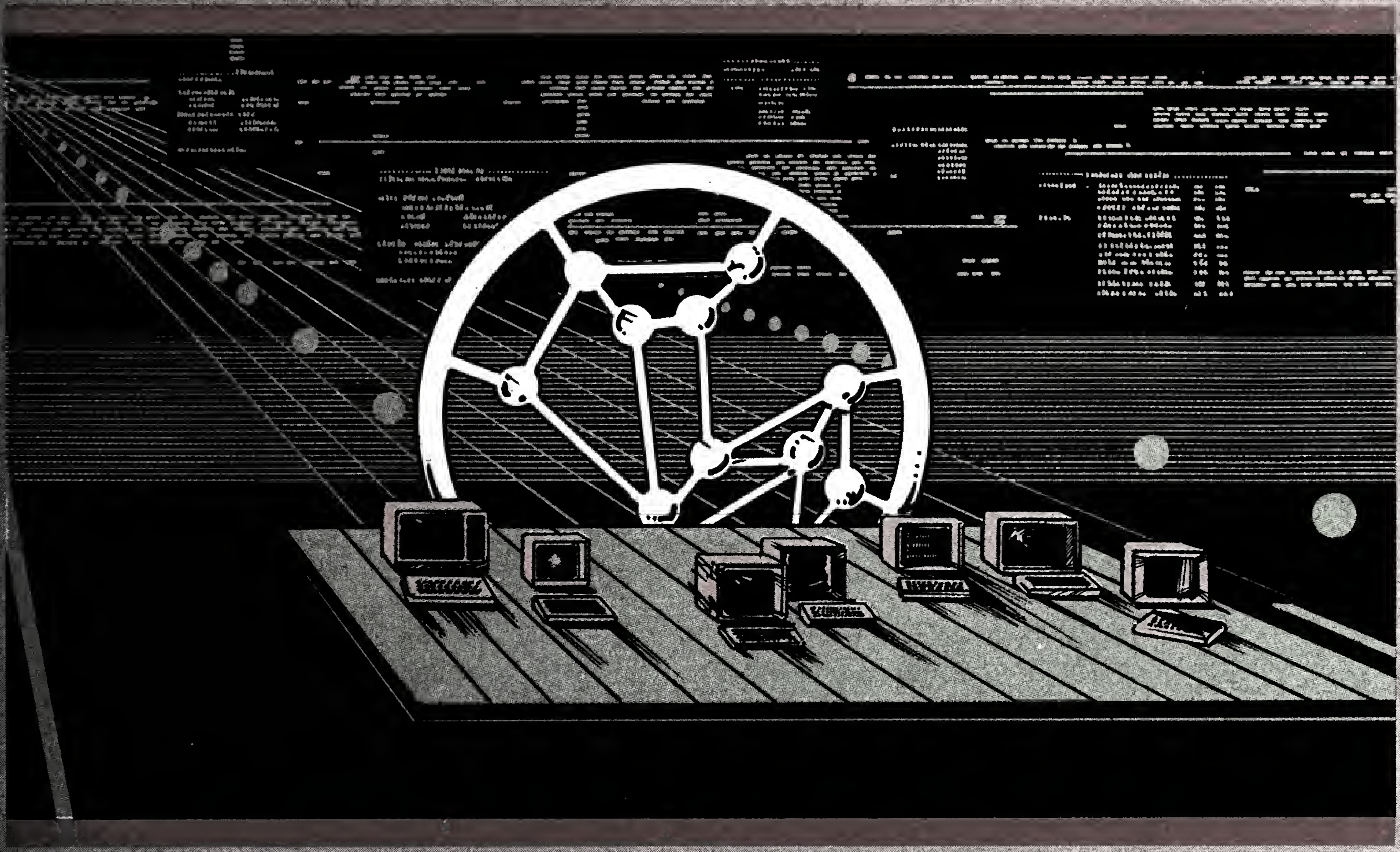

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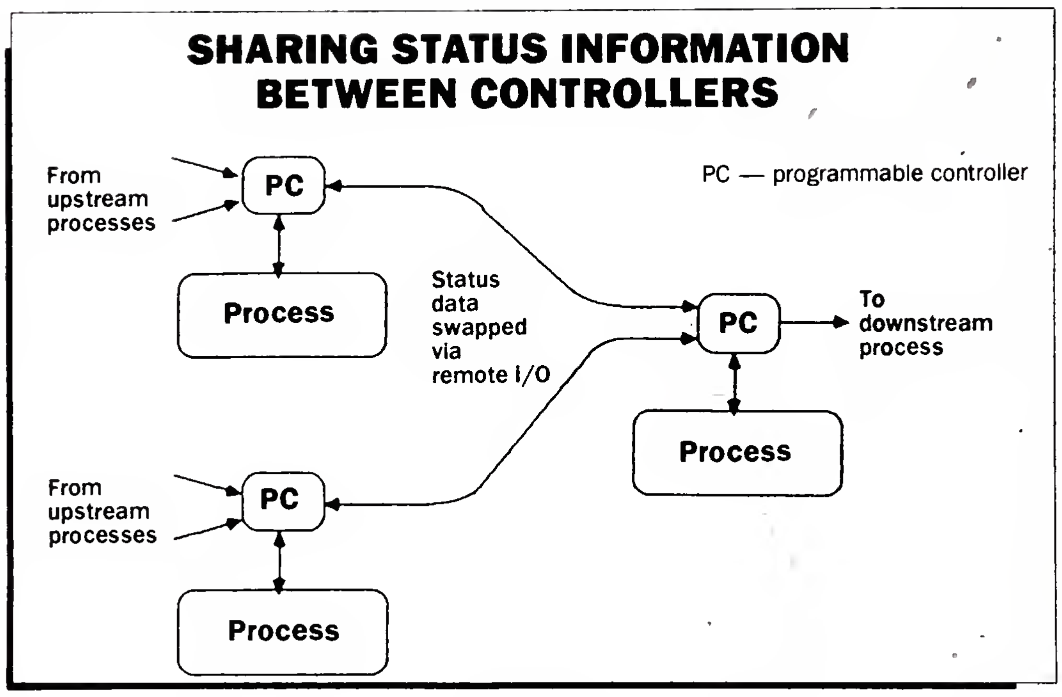
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Figure 4

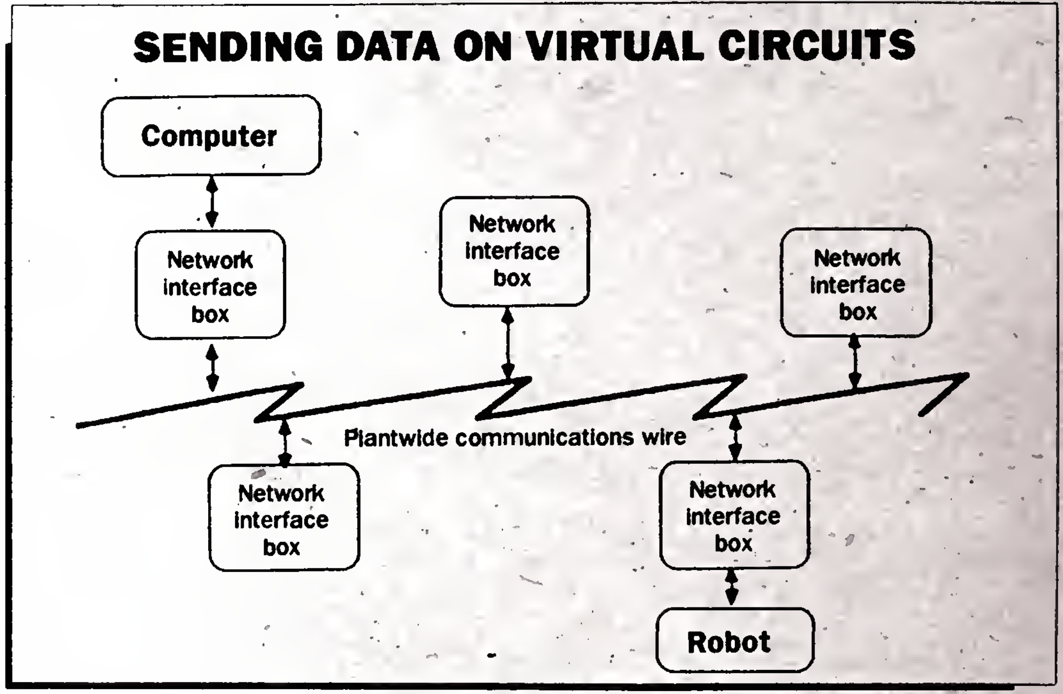
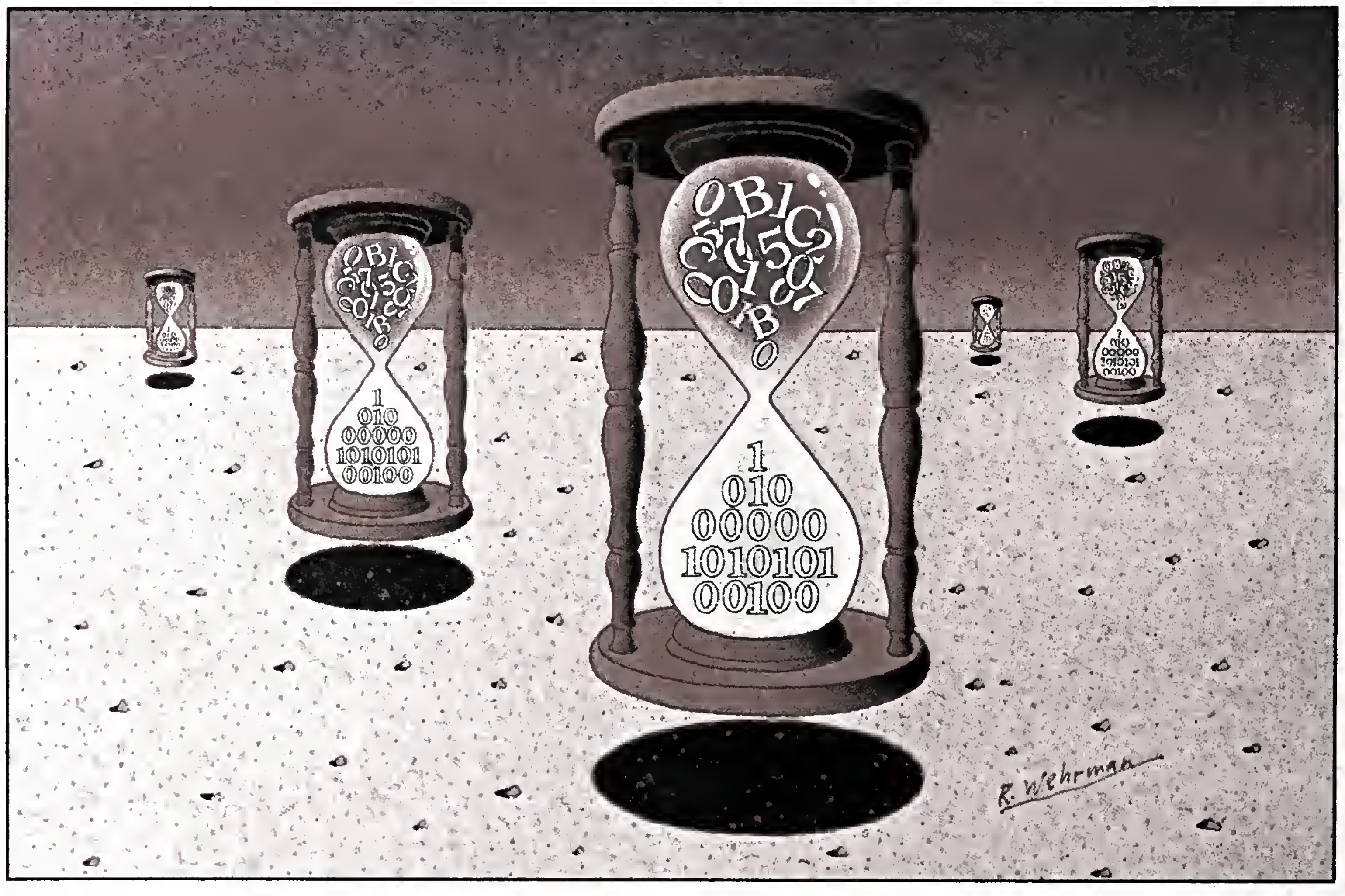


Figure 5

Without complete understanding of user needs, software development can take forever.



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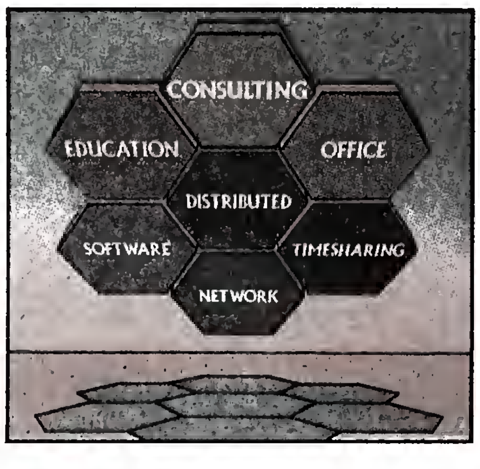

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Local-area networks supply many virtual circuits that computers use to communicate with devices (see Figure 5). The computer asks the network to establish a circuit between the computer and the robot. The network sets up the circuit and translates data between the computer's format and the robot's format. Again, this is like the telephone network — the system maintains a large number of two-way conversations on the same shared communications wires.

Broadcast data

Although they do not like to talk about broadcast data, network developers admit that broadcasting is a natural way for networks to operate. Since data shares a single cable, everybody sees everybody else's mail anyway. The protocol software carefully throws away mail for everybody else so that each device sees only its own. Storing all the mail would duplicate each device's status information in all the other devices. This arrangement would take too much buffer memory, so network builders prefer to offer virtual circuits instead.

There is an easier way to manage data sharing in a factory. Most of the nonsense with hierarchies of data controllers comes about because we do not have enough communications speed to send all the information on one wire. The limitations of two-way communications are imposed because networking boxes do not have enough buffer memory to store all the mail. Most processes need unpredictable amounts of data from other processes, and management reports need data from many processes at unpredictable times, so we really need a more flexible system.

There is an idea kicking around that we call the Big Bad Bus, or B-Cubed. B-Cubed uses a very fast fiber-optic network, which turns the entire factory into one address space. We can transmit 120 million bits per second on an optical fiber, which costs about $1 per meter. Stringing eight of those in parallel and assuming some loss because of communications overhead gives us a bus carrying 80 million bytes per second — about as fast as a minicomputer backplane.

All devices in the factory interface to the bus. The bus is set up so that its protocol is invisible to the devices. The entire factory operates as a single virtual memory with a 48-bit address space. That is 280 trillion bytes — more than enough for a big

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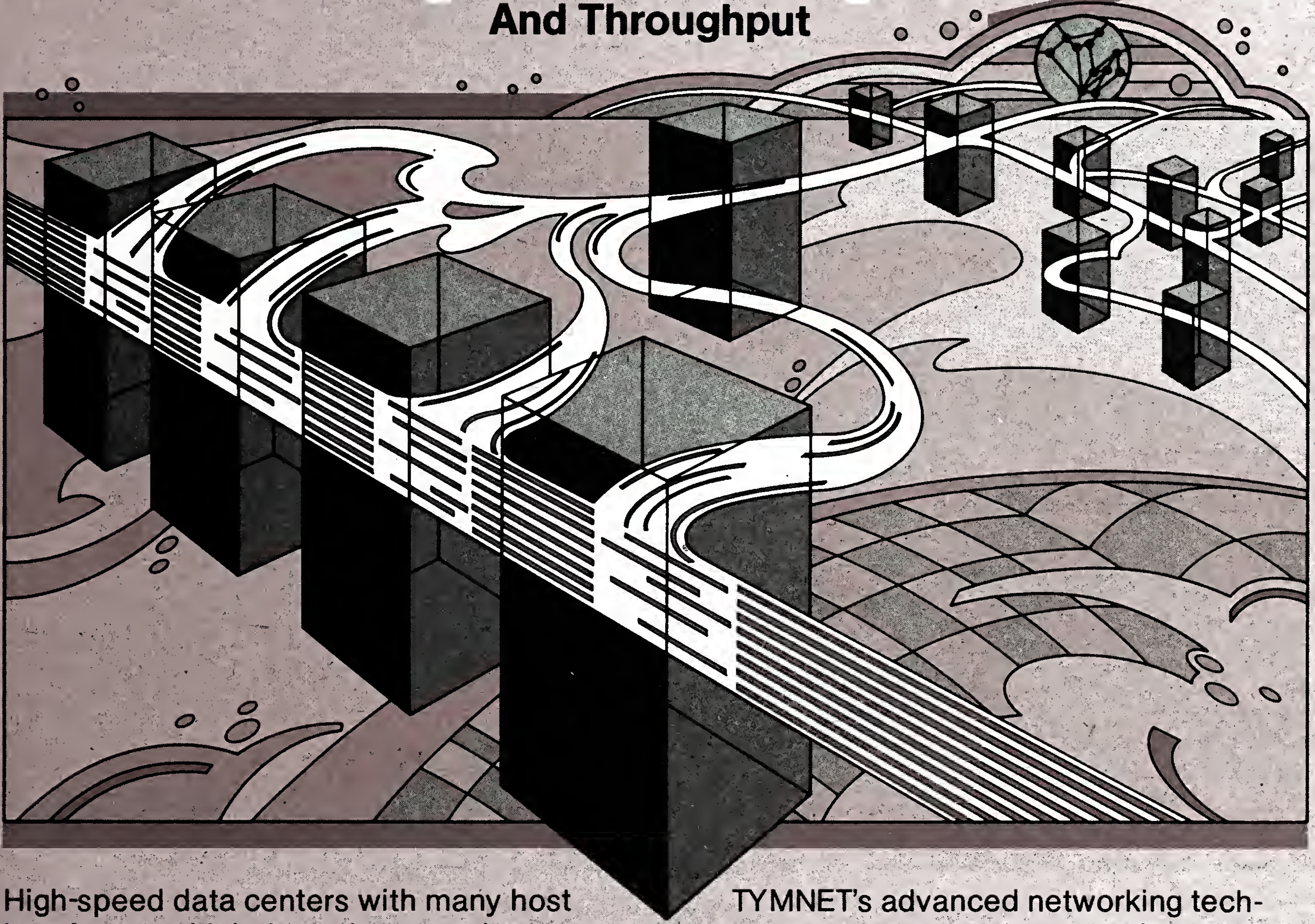

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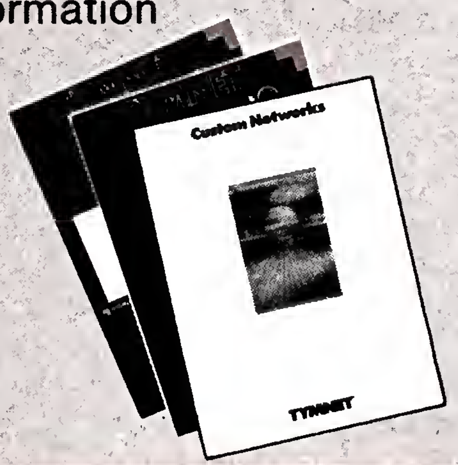

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factory. If we use 64 bits, all of General Motors Corp. might fit into one address space.

Each device has a special memory that acts like ordinary memory, except that read requests fetch data from somewhere else via the network. Application programs that need information just reference it; the bus interface makes memory in any part of the factory look as if it were part of the application program.

Memory management

This reduces the problem of virtual circuit and network management, which we do *not* understand, to memory management — which we *do* understand.

This is like using remote I/O to share status information. Each computer manages its process and stores summary reports in its public memory. Any other computer that needs the information just references the data, and the network supplies it. Applications programmers do not litter their programs with calls to networking routines — they just let compilers generate address references.

How B-Cubed works

Each device has private memory, which its processor uses without waiting for network access. The device stores public information in a part of its memory, which is managed by the network interface. The network interface transmits information from public memory whenever a request comes for that part of the factory address space.

When the processor requests data that is not in local memory, the network interface sends the address out over the network and stores the reply.

The low-order million bytes or so of factory memory stores a table of addresses. Whenever a new machine appears on the network, it searches this memory for the first unoccupied slot and puts its address there. An address server manages this address table. This arrangement makes address assignment automatic, and there are no address selector switches on any device.

The address server also maintains format information for each device. These format records are similar to data base schemata and tell how data records are laid out in each device. Other devices can read information from a device even if the data format changes.

When an application program starts, it searches for the addresses of the information it needs and stores the addresses in pointers. It also retrieves the format records so that it can decode the data fields. Later on, it accesses data by referencing it relative to the pointer.

Memory conflict is avoided by access rules. Each device writes into the part of the virtual memory that it controls, but nowhere else. No other device writes there, but any device can read from any part of memory.

When two devices need to interact, they set up mailboxes in their respective memory areas and use the mailboxes to send messages to each other. Any other device can watch to see what is going on, but no other device can interfere.

Operating the factory

Big Bad Bus turns the entire factory into a single computer with many processors. We understand how to coordinate multiple processes — operating systems like Unix have been doing this for a long time with semaphores, pipes, mailboxes and a few other mechanisms. We also know how to handle real-time interactions — Unix has been extended for real-time by a number of vendors.

One way to make effective use of factory data is to centralize data collection in a data acquisition program (see Figure 6 on ID/40). The data acquisition program establishes virtual circuits to all the data sources on the network and periodically polls each device for current information.

Factory status is stored in a factory image file on disk. This information is used by the MRP software to schedule the factory in the most profitable manner.

Centralizing the task of maintaining the image of the factory has problems, however. The data acquisition program has to poll for raw data, which causes heavy traffic on the communications network. It would be more economical for each device to maintain its own summary information and let any devices that need this information ask for it as necessary.

Software is simpler if the entire factory is treated as a single virtual memory space (see Figure 7 on ID/40). Each device has some private memory and some shared memory. The processor uses I/O points to control the process and also calculates summary information. Summary data is placed in shared memory. Whenever any other device or the central computer needs to know process status, it gets the information from the shared memory.

The communications protocol is hidden from each processor and from its software — each device treats all other devices as if they were locally addressable memory. Processors use local memory for most calculations to minimize traffic on the virtual bus. The server maintains the address table. It lists which device is located at each memory address and describes the public data area formats.

Special chips

Implementing Big Bad Bus requires special chips in order to keep the cost reasonable, but these chips should cost no more than Ethernet chips. These chips manage some virtual memory and transmit a few

"We had a thirty-day trial but twenty minutes made up our minds about Data Check Recovery."

Linda Lewis, Systems Programmer Blue Cross and Blue Shield of the National Capital Area Washington, DC

"We had been looking at Software Corporation's Data Check Recovery for nearly all of the 30-day trial period and we hadn't really made up our minds. It was useful, but we weren't convinced that it was necessary.

"Then we had a permanent data check in the middle of a five-pack VSAM file. It happened in the middle of the night and if we could not have restored the file quickly, it would have delayed users all over the country.

"Without DCR, the best that we could have hoped for is to have restored the file sometime the next day. At worst, the data was destroyed. But with DCR, it was just a matter of my sitting down at my terminal at home and telling Data Check Recovery to recover the file.

"That one incident made up our minds. If we had never used it again, it would have been worth the cost. But we have had three permanent data checks on our 3380s since then and with DCR, only one of them was really permanent."

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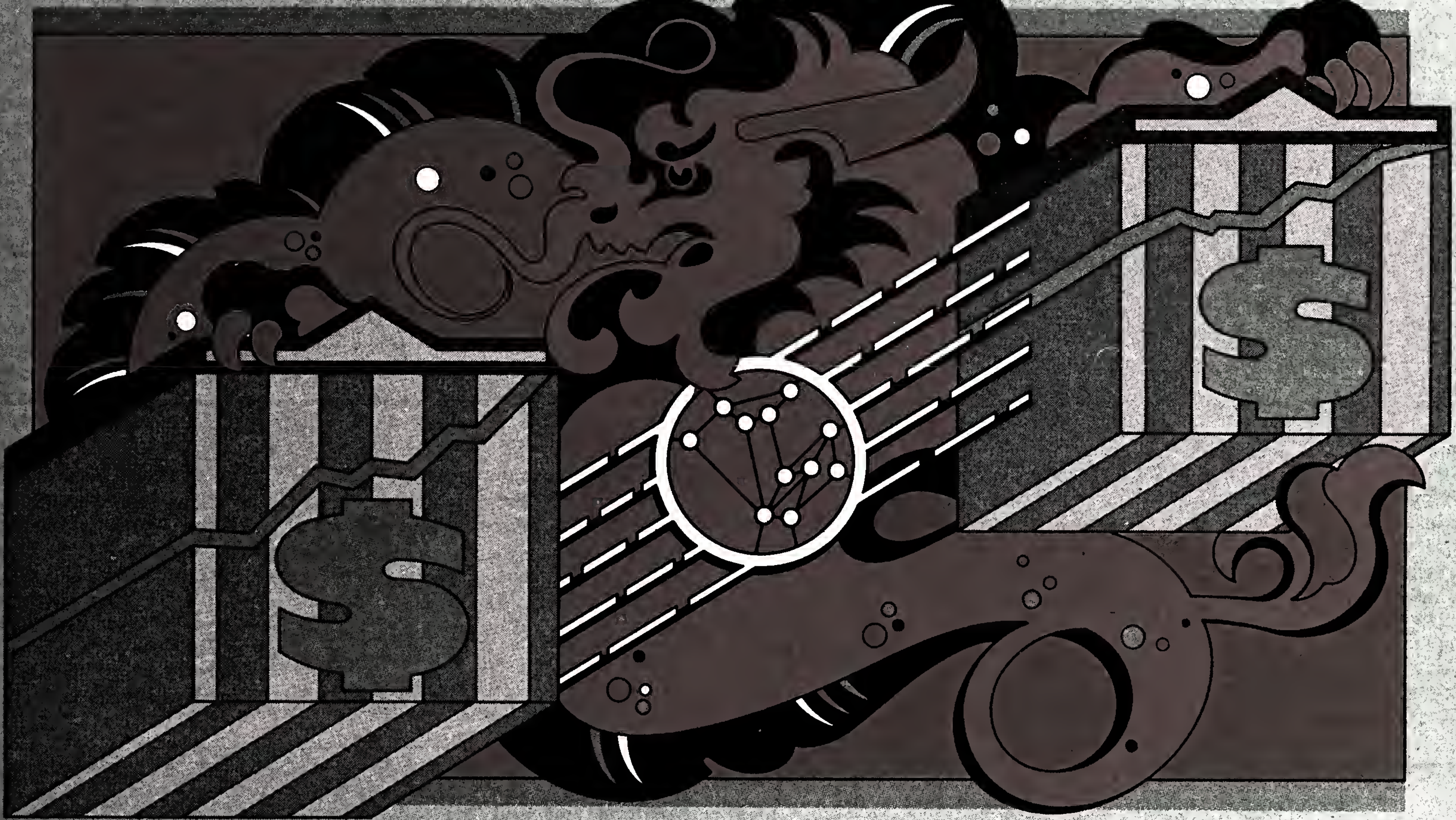

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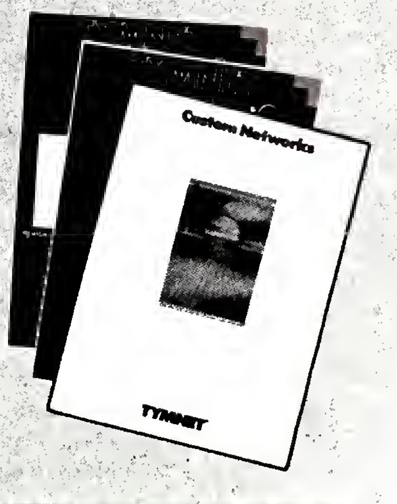

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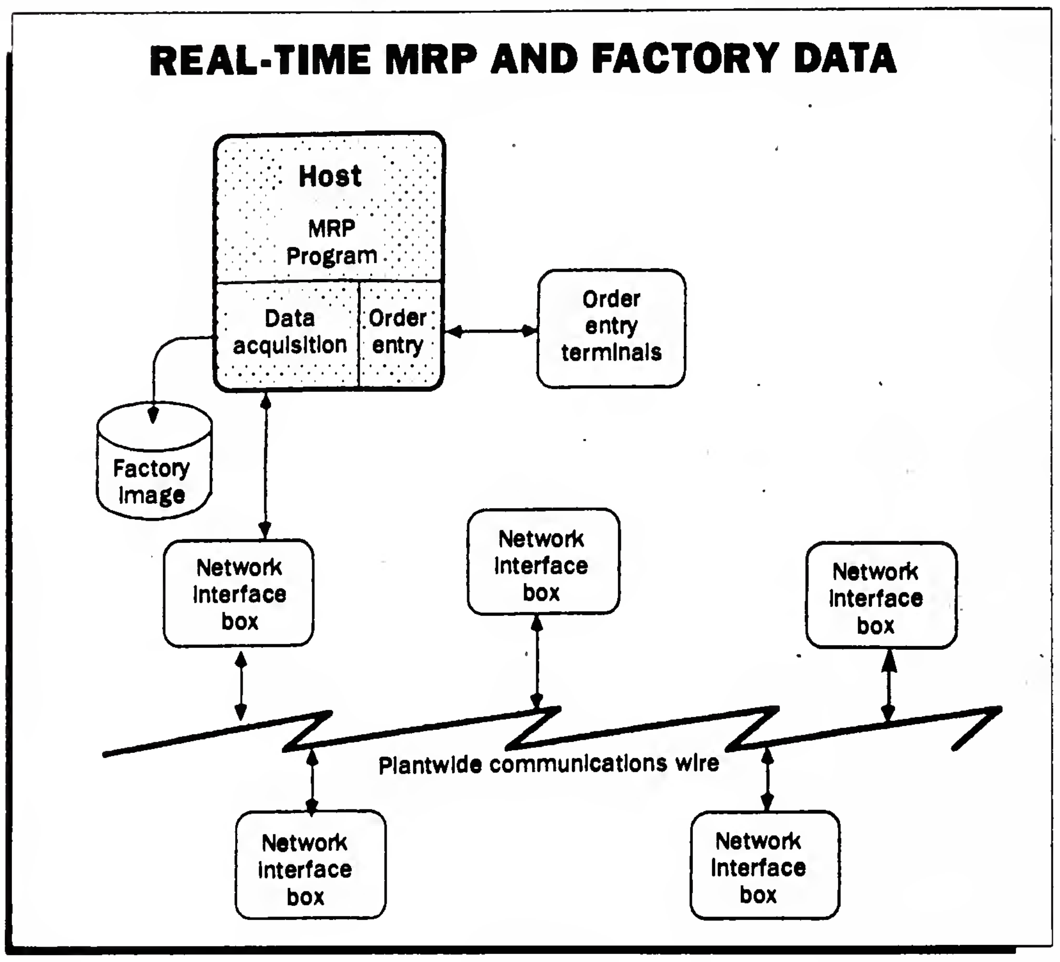


Figure 6

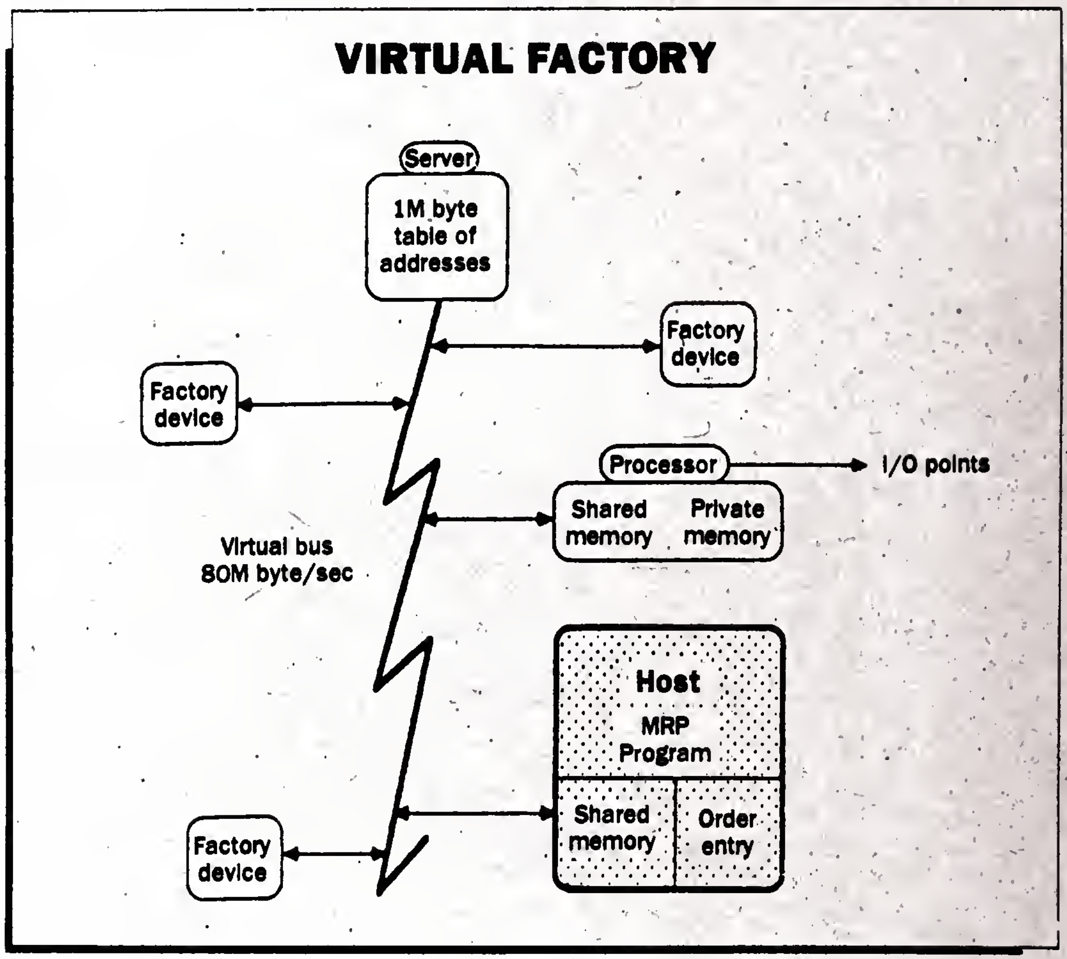


Figure 7

different message sizes, so they are simpler than proposed network boxes. Applications programs act as if factory status information were in memory at all times, so they become much simpler than if they had to get information over a network or from a data base.

This simplifies applications just as managing distributed processes via remote I/O simplifies programmable controller programming.

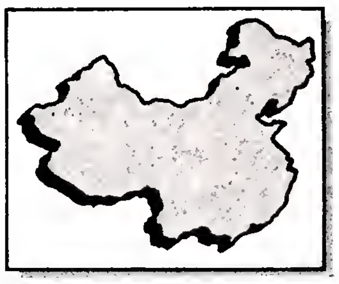
We have shown why network hierarchies do not operate factories as effectively as we would like. We need networks to control individual machines, so substituting remote I/O for networks will not solve all our problems.

Networks were designed to implement two-way conversations rather than broadcasts, which makes applications software more complicated than is necessary.

Turning the entire factory into a single address space via the Big Bad Bus simplifies the software in each device and eliminates most of the software in the network boxes. B-Cubed uses the speed of fiber optics to simplify the networking and applications software.

About the author

William Taylor leads the Office of Advanced Systems and Software Technology, Industrial Automation Section, at Gould, Inc. Taylor has worked with programmable controllers and interactive motion controllers. He is the coauthor of an executive report titled "Demystifying Artificial Intelligence."



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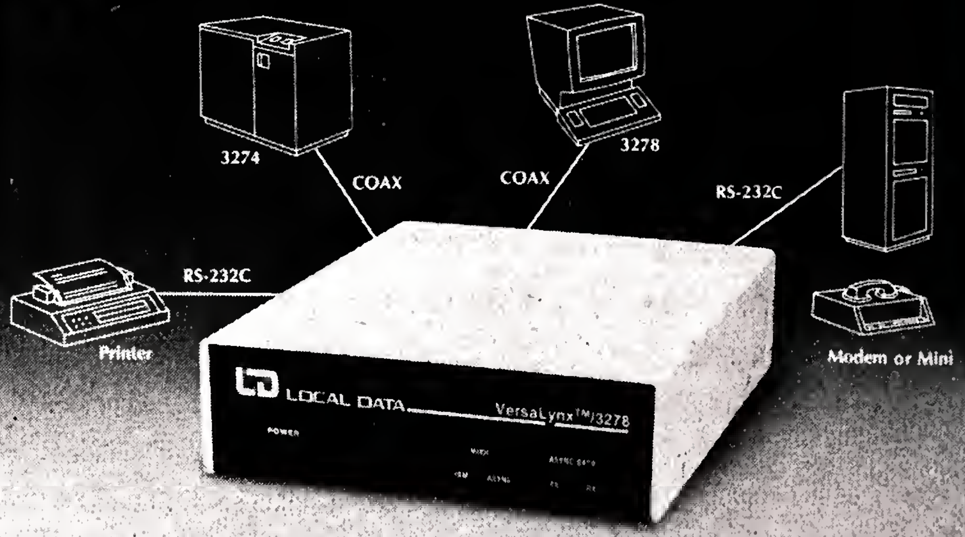

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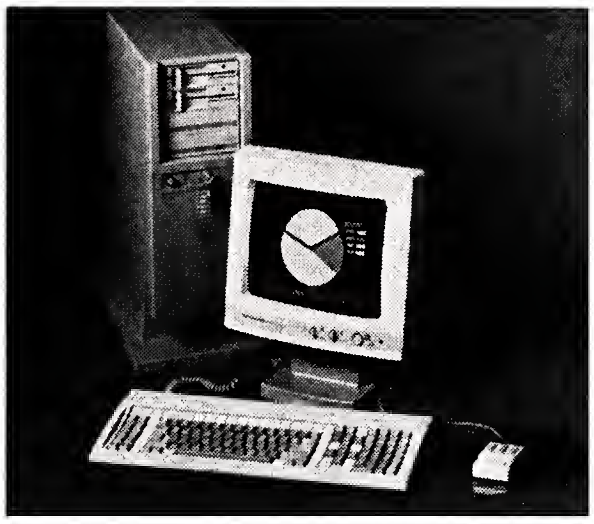
MICROCOMPUTERS

TI introduces Business-Pro high-end micro

By Edward Warner
CW Staff

DALLAS — Texas Instruments, Inc. unveiled last week a 512K-byte personal computer that reportedly can function as a stand-alone unit, a local-area network server or the hub of a multiuser system supporting up to eight users.

One version of the TI Business-Pro would reportedly come equipped with a 21M-byte hard disk and CRT controller that would allow it to function as the equivalent of the enhanced version of an IBM Personal Computer AT, a machine for which prospective users are currently facing a nine-month wait.


The TI Business-Pro

Based on the Intel Corp. 80286 microprocessor, with a reported memory expansion capacity to 3.5M bytes, the Business-Pro is said to offer the speed and memory needed to run software having artificial intelligence capabilities. It debuted with a program called Arborist, which TI said adapts AI to decision management.

The Business-Pro, TI said, will become part of the firm's Professional series of personal computers and will initially be offered in two single-user versions, both running under Microsoft Corp.'s MS-DOS and available in June. A multiuser, multi-

See **TI** page 90

TI software aids decisions

DALLAS — In addition to unveiling a high-end version of its Professional personal computer late last month (see story this page), Texas Instruments, Inc. expanded its artificial intelligence offerings for the microcomputer line.

TI introduced an AI-based decision-making software package and enhancements and price cuts for its Naturallink Technology Package, a development system for natural language applications.

Also announced were additional speech features for the Professional, which has long had the option of a TI Speech Command voice recognition interface.

Called Arborist, the TI decision management software reportedly allows de-

See **AI** page 90

- Ashton-Tate introduced versions of its Dbase III data base management system for the AT&T Unix PC and Data General DG/One laptop computer/**75**
- A coprocessor device that lets Apple Computer's Macintosh run IBM Personal Computer software was unveiled by Dayna Communications/**75**
- ADP Network Services announced software designed to improve remote data entry on IBM Personal Computers/**78**
- Alpha Software unveiled Keyworks, a macro-generation package for the IBM Personal Computer/**78**
- IBM released software that manages applications on the Personal Computer line/**79**

SMALL TALK
Paul Korzeniowski
CW Staff

PCjr needed more than Big Blue logo

For more than two decades, the name of IBM has been synonymous with success. On a few occasions, Big Blue has stubbed its toe when entering a new market, but never has the company fallen on its face as it did last month when it dropped the PCjr.

Why did Big Blue tumble?

A chief reason was that IBM did not differentiate between the home, education and business markets. Filled with hubris from its smashing entry into the

See **FALL** page 86

Cartridge tape subsystems bow

LOVELAND, Colo. — Two ¼-in. tape cartridge subsystems for use with the IBM Personal Computer line, including the Personal Computer AT, have been introduced by Colorado Memory Systems, Inc. (CMS).

The two subsystems, one offering 60M-byte tape backup and the other offering a combination of 60M-byte tape and a 20M-byte hard disk, will be marketed under the Tecmar, Inc., label, CMS said. Each unit is said to be small enough to sit on the Personal Computer itself and to incorporate tape storage units having three heads, a feature said to speed data verification.

The extra heads offer immediate read-

See **TAPE** page 86

Multimate-Wang conversion offered

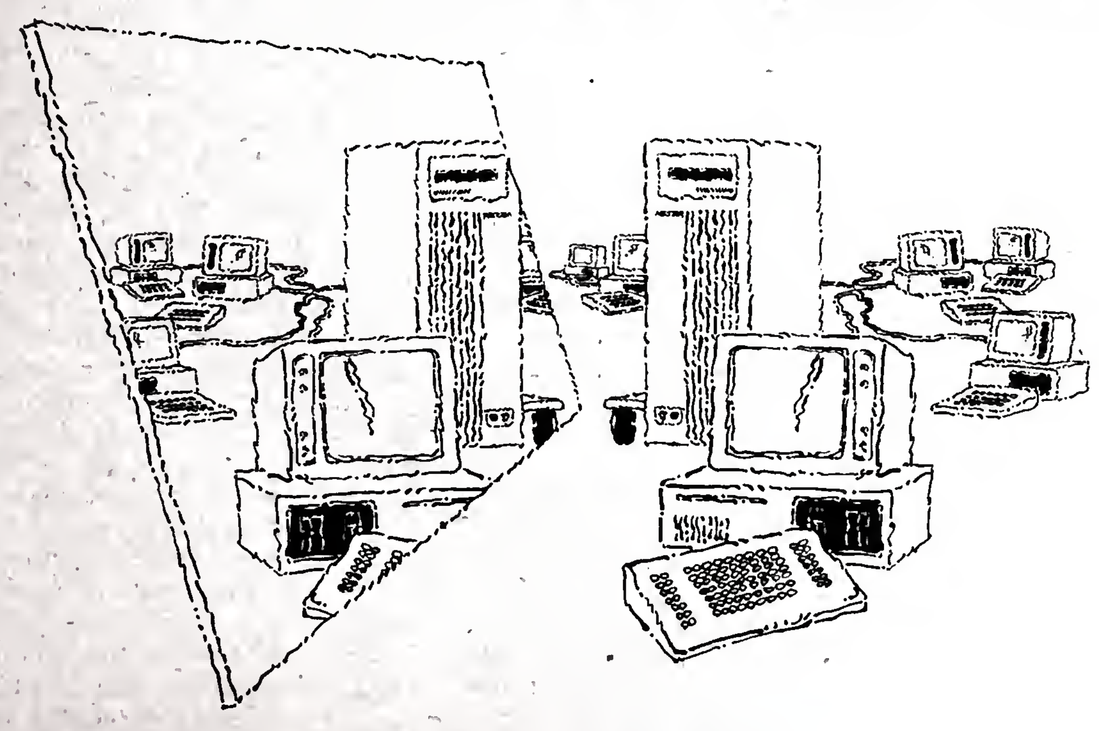
EAST HARTFORD, Conn. — Multimate International Corp. has introduced a conversion program to permit documents created under its Multimate word processing program to be transferred between IBM Personal Computers running the software and the dedicated word processing minicomputers of Wang Laboratories, Inc.

Multimate documents are reportedly converted into Wang's WPS format, its document interchange format for transfer of documents among its family of dedicated word processors. The conversion reportedly maintains nearly 100% of document integrity, with the need for little or no cleanup editing.

The conversion is also said to retain

See **WP** page 86

Mirrored Hardware



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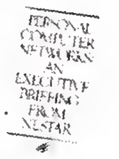
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Micros gain graphics tools

MICRO BITS
Kathryn Alesandrini

For a price, microcomputer business graphics can look as crisp and colorful as graphics straight from the art department. But without paying extra, you are often faced with the choice between colorful graphics or graphics with clarity and higher resolution.

For example, IBM Personal Computer screen graphics are colorful, but they lack precision since the standard screen resolution is only 320 by 200 pixels. Apple Computer Inc.'s Macintosh sacrifices color to provide better resolution, coming in at 512 by 342 pixels. The choice between resolution and color is involved in many microcomputer purchasing decisions.

When a limited budget forces a choice, do people opt for color or do they want precision in business graphics? That choice was recently posed to a group of managers and a group of trainers. The trainers overwhelmingly opted for resolution, while the managers were equally split between color and resolution.

> ”
> *New hardware and software can transform micro graphics into snappy, full-color graphics at a fraction of the cost of traditional graphics.*

The survey also tested the respondents' preferences for visual thinking and their visual abilities. The first group included 63 managers and information center professionals. They were asked a series of questions from a "Visualizer Verbalizer Questionnaire" such as "Do you like doing work that involves the use of words?" and "Do you have vivid dreams?"

A closer look at the data reveals some interesting differences between those who picked color and those who picked resolution. Here's a summary:

- Verbalizers prefer resolution. People who tend to rely on verbal thinking rather than visual thinking prefer displays of high resolution when a choice must be made between resolution and color. Verbalizers would rather follow verbal directions than see a demonstration. For instance, they prefer to read written directions than to look at a map when finding a new location.
- Color is more visual. Visualizers and "right-brain" thinkers prefer color displays. They will sacrifice the crisp look of higher resolution graphics to have color.

What do these results mean for those users of presentation graphics? One implication is that presentation graphics should be tailored to the audience.

Show engineers, computer specialists, lawyers and other verbalizer groups prefer crisp, high resolution graphics. But use of colorful displays will attract visualizers such as pilots, artists, athletes and some managers.

To be on the safe side, go for colorful and high-resolution graphics so everyone is happy.

New combinations of hardware and software can transform microcomputer graphics into snappy, full-color graphics at a fraction of the cost of traditional graphics.

Truly state-of-the-art graphics usually have been created on mainframes and minicomputers, complete with high-resolution film recorders that create picture-perfect slides.

But now there are two main ways to achieve a similar look with microcomputers: add upgraded hardware or take your graphics needs to a service center for enhancement.

You can have a graphics workstation that almost rivals what the big boys have if you are willing to invest in a high-resolution color card, a high-resolution monitor and a film recorder. For example, IBM's Enhanced Color Display with an upgraded graphics card is 640 by 200 pixels, although currently there are few graphics programs that will run on the enhanced version.

High-quality output can be accomplished by way of a film recorder. For a whopping 4,000- by 4,000-pixel line resolution, there's the Samurai recorder, which cuts off the jagged edges of microcomputer graphics to produce crisp, colorful images. The limitation is that the film recorder currently accepts input from only one program — the company's own graphics software package.

Coming in at 640 by 400 pixels with up to 72 colors is the Polaroid Corp. Palette recorder with an affordable price tag. Actually, the Palette itself is capable of resolutions of up to 920- by 700-pixel lines, but current software does not make use of that potential.

No time or money for in-house imaging? Now there's the picture-perfect connection. Graphics enhancement services allow you to send your micro graphics over phone lines for enhanced colors and better resolution. The only costs are for the transmission software, the standard modem for data communications and the service center charges for slides and so on. Once enhanced, your graphics can be returned as 4,000- by 4,000-pixel picture-perfect slides.

Imedia Corp. offers the support package PC Presents! that automatically converts Lotus Development Corp.'s 1-2-3 formats into code that can be communicated to the high-

See **GRAPHICS** page 83

Alesandrini, president of Microconnect in Santa Monica, Calif., writes frequently on business applications of computer graphics.

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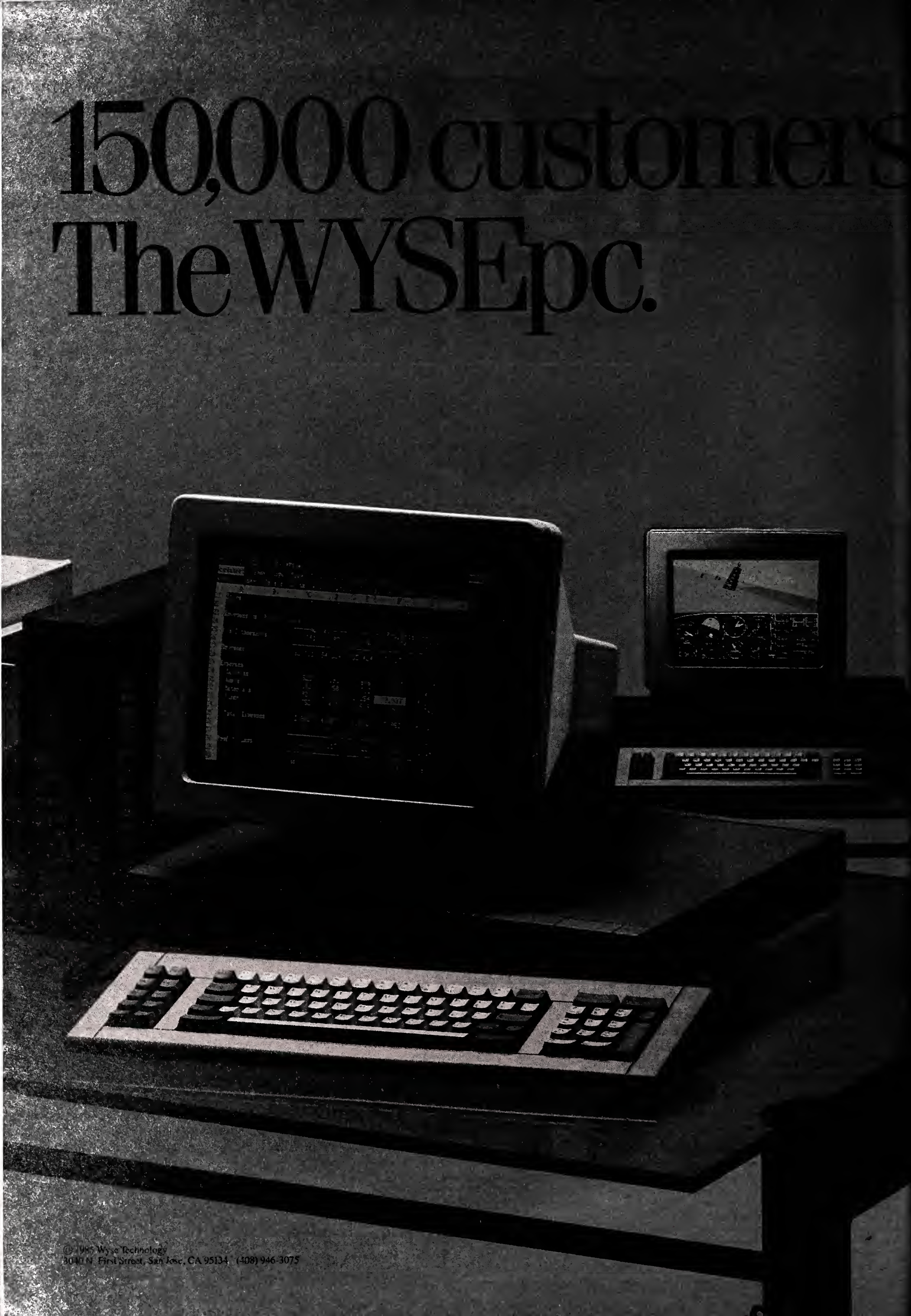

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Each site includes a profile of the hardware installed, software installed, (languages, databases, etc.), consultants used, future plans, applications and DP executives' names, titles, and phone numbers. An index provides quick access to 133 cross references by hardware, software and industry. Price: NY-$370 and MA-$295. Call (212) 683-0606. Computer Management Research, Inc. 20 Waterside Plaza, NY, NY 10010.

• ADVERTISEMENT • ADVERTISEMENT •

Optionware adds WP to Lotus' 1-2-3

BLOOMFIELD, Conn. — The introduction of Optionword+ from Optionware, Inc. reportedly brings word processing capability to Lotus Development Corp.'s 1-2-3 software.

Optionword+ reportedly operates in the 1-2-3 environment with no need to change programs and uses 1-2-3's mathematical abilities to construct tables that can be inserted into text. It also offers graphics capability as well as calendar management functions, a telephone directory and a to-do list.

The package's word processing functions reportedly include justification, insertion, deletion, erasure and the capacity to edit and copy. Users can set up paragraphs and margins and are informed of page breaks on the screen.

The software's to-do list is said to have a capacity for up to 40 activities; deadlines and priorities can be assigned to each. Its calendar management function includes an appointment scheduler and calendars for the years 1985 to 1988.

Under Graphmate, its graphics function, the software reportedly lets users develop graphs by filling in data screens. Among the graph types available are line and stacked bar. Graph formats can be changed with one keystroke.

Optionword+, available this month, requires a minimum of 256K bytes of internal memory and is priced at $99.95.

More information is available from Optionware, located at Corporate Place, Four Barnard Lane, Bloomfield, Conn. 06002.

IBM offers Slidewrite software

WHITE PLAINS, N.Y. — IBM has introduced Slidewrite software for the creation of presentation-quality text slides using the IBM Personal Computer.

Slidewrite reportedly allows slides to be produced on paper or on overhead transparency film with an IBM 7371, 7372, 7374 or 7375 color plotter or IBM Graphics Printer.

The package features the ability to edit text or enhance charts using lines, arrows and boxes and to shrink or expand text automatically, according to IBM.

The software generates high-resolution characters, provides batch capability for unattended printing and can transform Ascii text files from a word processor or spreadsheet into charts, IBM said.

It can also retrieve IBM Displaywrite 2 or Displaywrite 3 print files or Displaywrite 3 Ascii files that have been saved on a diskette or disk.

Slidewrite requires a minimum of 128K bytes of internal memory, a graphics adapter card and an output device.

It is priced at $225, IBM said.

More information on Slidewrite is available from IBM National Accounts Division, which is located at 1133 Westchester Ave., White Plains, N.Y. 10604.

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Device enables Macintosh to run IBM software

By Kathleen Sullivan
CW West Coast Bureau

SALT LAKE CITY — In an effort to make Apple Computer, Inc.'s Macintosh computer "more appealing to IBM-biased computer users," Dayna Communications recently announced MacCharlie, a coprocessing device the company said will allow Macintosh users to run IBM software.

MacCharlie, a separate hardware unit that connects to the Macintosh with cables, is an L-shaped box with a custom-designed pedestal. According to the firm, MacCharlie is designed so that users can place a Macintosh on the pedestal, where the two units fit snugly together.

Once the systems have been connected, users can run the Macintosh in its own mode or in an IBM Personal Computer mode, the company said. By selecting the IBM mode, users will be able to run IBM applications software on the Macintosh.

According to the firm, the system will allow users to transfer information from an IBM applications program to a Macintosh program. For instance, a user could transfer information from a Lotus Development Corp. 1-2-3 spreadsheet to the Macintosh's clipboard and then paste the data into a Macwrite document. However, the information could not be manipulated once inside the Macwrite document, a company spokesman said.

MacCharlie is said to allow users to transfer Ascii data files between MacCharlie's 5¼-in. disk drive and the Macintosh's 3½-in. disk drive.

The system, which is based on an Intel Corp. 8088 microprocessor, reportedly includes 256K bytes of random-access memory (RAM) and one 5¼-in. 360K-byte double-sided, double-density disk drive. Dayna also plans to offer MacCharlie Plus, which will include 640K bytes of RAM and two disk drives, according to a company spokesman.

MacCharlie comes with Microsoft Corp.'s MS-DOS 2.1 and Gwbasic, the company said. It includes an RS-232 serial communications port and an Apple Imagewriter printer port. In addition, the system is said to feature an IBM expansion chassis connector.

MacCharlie will be available in late May, according to Dayna President William K. Sadleir. MacCharlie will cost $1,195, and MacCharlie Plus will cost $1,895.

More information is available from Dayna Communications, Suite 530, S. Main St., Salt Lake City, Utah 84144.

Ashton-Tate rolls out tools

CULVER CITY, Calif. — Ashton-Tate has introduced versions of its Dbase III data base management software for the new AT&T Unix Personal Computer and for the Data General Corp. DG/One laptop personal computer. Framework, an integrated multifunction software package, will also be offered for the DG/One, Ashton-Tate said.

Dbase III, a relational data base management package, reportedly allows users to develop customized applications that put data base files to use. It offers storage capability of two billion records per file and 128 fields per data base.

Framework is said to produce documents containing graphs, outlines, text, spreadsheets and data base information. It also offers a high-level programming language and a telecommunications module.

Ashton-Tate is located at 10150 W. Jefferson Blvd., Culver City, Calif. 90230.

Share It out for IBM net

PRINCETON, N.J. — Martin Marietta Data Systems, Inc.'s It Software Division has announced Share It, a multiuser data base management system for the IBM PC Network.

The product is said to bundle It Software's Keep It Plus data base management software with Cogent Data Technologies, Inc.'s data base machine board. Share It is also reportedly compatible with the Gateway G/Net adapter card used in the Novell, Inc. Netware/G and with personal computer net boards manufactured by AST Research, Inc. and Orchid Technology, Inc.

With the Cogent board, Share It reportedly maintains data base index files on the board itself. The board is said to handle all file access with an Intel Corp. 80186 coprocessor and disk controller and includes firmware for flat file access, B-tree indexing and record locking.

Shipment of the product is not anticipated until the release of IBM PC-DOS 3.1 and the IBM PC Network program required to operate the network, the vendor said.

Share It's price ranges from $850 to $1,450, depending on the number of workstations. The Cogent board costs $1,750 for the IBM Personal Computer XT and $1,995 for the Personal Computer AT.

More information is available from Martin Marietta Data Systems, P.O. Box 2392, Princeton, N.J. 08540.

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The carrier on the right is the Telecopier 295, a new high-speed facsimile just introduced by Xerox.

While it's not quite as flashy as the Concorde on the left, the technology is just as amazing.

Imagine a small, desktop digital facsimile that can transmit high resolution copies of your documents anywhere in the world in little more than the time it takes to fasten your seat belt.

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It's compatible with just about everything: the Xerox Telecopier family, most other facsimiles, and with the personal computer

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world as well, including the computers and workstations that are part of Team Xerox.

With the G1/G2 analog compatibility option, it can communicate with other slower speed facsimile terminals. With the RS-232-C option, it can also convert and print ASCII encoded information from a vast array of computers.

But the most amazing thing about the Telecopier 295 is its price: about the cost of one round trip to Paris on the Concorde.

Now that's progress.

To learn more about the Telecopier 295, call 1-800-833-2323, ext. 44, or send your business card to Xerox Corporation, Dept. 44013, P.O. Box 24, Rochester, N.Y. 14692.

Team Xerox

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ADP Network Services remote computing product bows

ANN ARBOR, Mich. — ADP Network Services, Inc. has unveiled software that can reportedly improve the ease, speed, accuracy and economy of remote data entry with an IBM Personal Computer.

Called ADP/Preface, the software is said to aid in the creation of user-defined screens and menus for full screen data entry to a remote ADP Network Services central computing system. It can also develop data entry front ends for users' custom applications and for applications built around ADP Network Services' prepackaged software for financial analysis, project management or other applications, according to ADP Network Services.

The development of formats for data entry screens reportedly can be done entirely on the Personal Computer. Developers paint each screen by specifying titles, prompts, data types and field parameters in their choice of colors as well as layouts.

Valid ranges or lists of acceptable responses for each prompt can be specified, ADP Network Services said. Screen formats defined by the software can be used for on-line and off-line data entry.

ADP/Preface users must first obtain direct Personal Computer access to an ADP central computing system, using the software's terminal emulation capabilities. A data entry screen is then displayed and stored on the Personal Computer. Users enter the appropriate data and receive immediate validation for each data field.

The software is available to ADP Network Services clients for a $995 companywide license fee, which includes two copies of the software, documentation and a function key template.

ADP Network Services is located at 175 Jackson Plaza, Ann Arbor, Mich. 48106.

IBM micros gain macro program

BURLINGTON, Mass. — Alpha Software Corp. last week introduced Keyworks, a keyboard macro program for the IBM Personal Computer and compatible machines.

Priced at $89.95, Keyworks is said to be a menu-driven program for creating macros that permits users to record sequences of keystrokes and later access them with only one or two keystrokes.

Keyworks permits users within an applications program to assign both a name and a description for each macro and to get an on-screen directory of each macro, Alpha Software said. Keyworks also features a full screen pop-down editor for making immediate changes to macros.

The main Keyworks menu reportedly allows users to list, edit, save and get macros. In addition, it provides Microsoft Corp. MS-DOS functions within the application, allowing users to list directories, rename files, erase files, create files, create and delete subdirectories, change the logged disk drive or format a diskette without leaving the program.

A screen-save feature turns the screen off after a specified period of time to avoid burning an image into the screen. Pressing any key restores the screen, Alpha said.

Keyworks is said to be compatible with most major business programs, including Lotus Development Corp.'s 1-2-3, Multimate International Corp.'s Multimate, Micropro International Corp.'s Wordstar, Microsoft's Multiplan, Ashton-Tate's Dbase II and Dbase III, Alpha Software's Electric Desk and others.

The package requires a minimum of 64K bytes of random-access memory and IBM PC-DOS or MS-DOS 2.0 or above.

Alpha Software is located at 30 B St., Burlington, Mass. 01803.

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IBM program organizes Personal Computer applications

WHITE PLAINS, N.Y. — Two months after it began shipping its Topview windowing environment for its Personal Computer, IBM has introduced a program for the micro that reportedly allows users to switch instantly between installed applications much as Topview does.

Also like Topview, the IBM Personal Computer Organizer software is said to permit users to transfer some data between programs. Topview costs $149; Personal Computer Organizer is priced at $150.

Unlike Topview, though, Personal Computer Organizer does not provide windowing or the capacity for concurrent processing, IBM said. Instead, it reportedly gives users a menu of their installed programs and permits them to switch to another application by hitting one key.

According to IBM spokesman Thad Madden, Personal Computer Organizer's ability to aid program installation is its main advantage over Topview. "Topview is for people who use the Personal Computer for a variety of tasks at the same time," Madden explained. "Organizer is for organizations with varying applications requirements, especially large organizations."

File movement under Personal Computer Organizer reportedly can be done either automatically or from a menu.

The receiving application must be able to handle nonkeyboard input and accept the format of the incoming file, IBM added.

Personal Computer Organizer reportedly provides onscreen installation information for 12 applications and allows users to add installation information on others. Installation information is provided for IBM's Professional Office System Personal Computer Connection, Displaywrite 1, 2 and 3, the Personal Decision Series, Lotus Development Corp.'s 1-2-3 and other packages. Users also can create their own menus of installed applications.

Required for use with the organizer program are a hard disk unit, the IBM 5153 color display with Color Graphics Adapter, the IBM 5152 graphics printer or equivalent and 128K bytes of memory plus the minimum memory required by the largest installed program.

The Information Systems Group of IBM's National Accounts Division is located at 1133 Westchester Ave., White Plains, N.Y. 10604.

Windowing developed for Xenix

DALLAS — Five Paces Software, Inc. has announced Viewnix, a windowing interface for Microsoft Corp.'s Xenix operating system running on the IBM Personal Computer AT and XT.

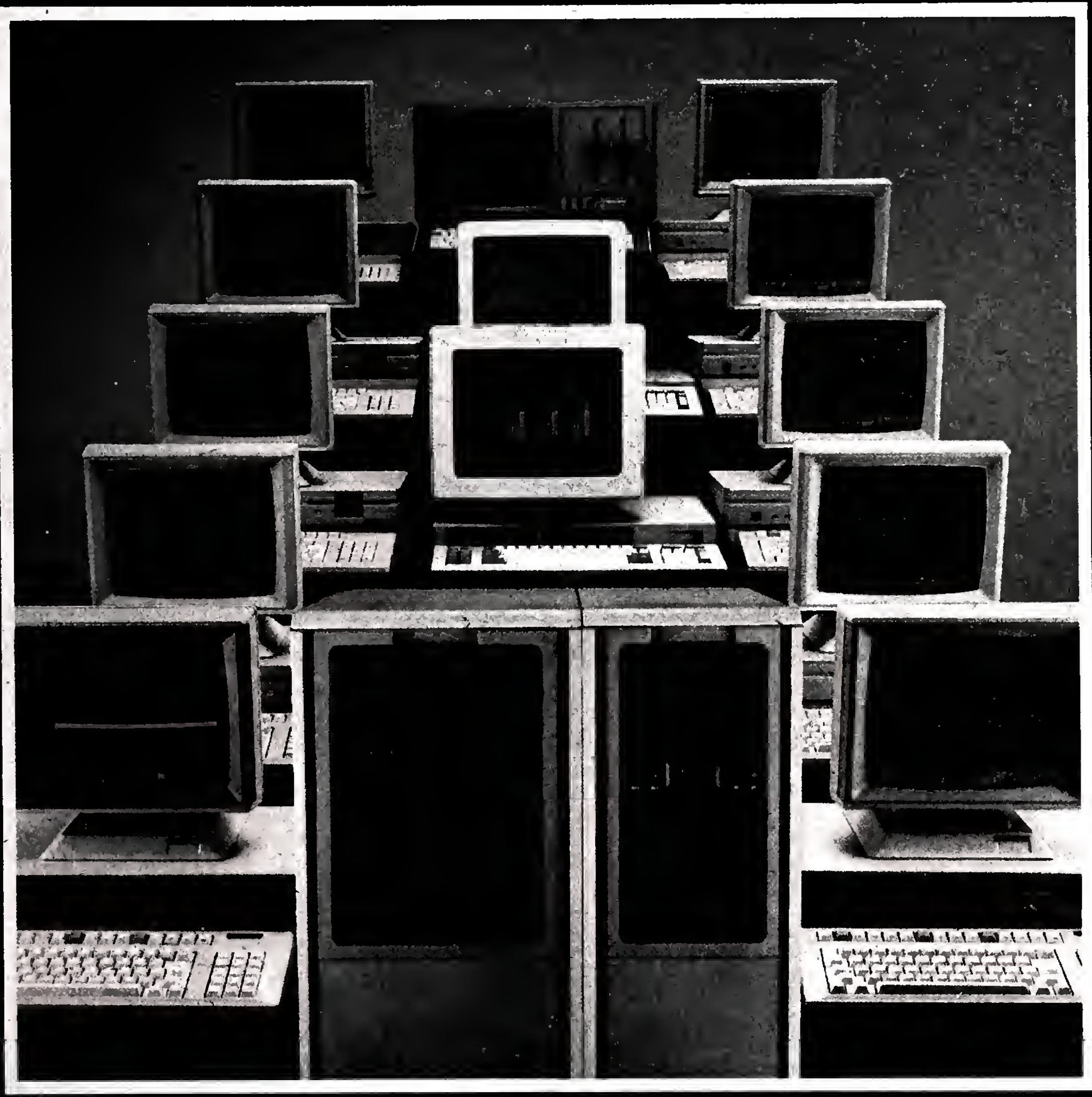
Viewnix reportedly allows the user to configure up to 10 windows on the screen of the AT, each of which can contain any standard Xenix application. The product is said to provide cut-and-paste capability for integrating data between different applications.

The product reportedly offers a programming interface to allow applications to control specific windows and to write directly to the window memory buffers.

The vendor is also offering the Unimove integration facility and the Unilink communications program for use with Viewnix. With Unimove and Unilink, users can reportedly communicate with other terminals through a single window and selectively move data from the remote machine into an application running in another window.

Viewnix is priced at $249, and Unimove and Unilink each cost $149.

Five Paces Software is located at 9635 Wendell Road, Dallas, Texas 75243.



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2 Only at the expense of features. Often it's obvious where they've cut corners:

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3 We human-engineered the Ampex 210 with a full 14" screen that tilts and swivels to just the angle you need. So it's comfortable to use, no matter how you're positioned.

7 As well as the local editing and block mode transfer capacities you need to speed work flow.

8 Plus 16 resident emulations you can switch at the touch of a key. Including the TeleVideo 910, 910+, 912, 920 or 925*..

9 The Lear Siegler ADM 3, ADM 3A, 3A+ or ADM 5*..

13 What's more, we'll add more. In OEM quantities, we'll customize our 210's appearance, personality and programming so it's perfectly suited to your needs.

14 And if you need a more powerful terminal with even more features, consider the next step up in our family of terminals: the Ampex 230.

15 We back every Ampex terminal with a six month warranty and a worldwide service network.

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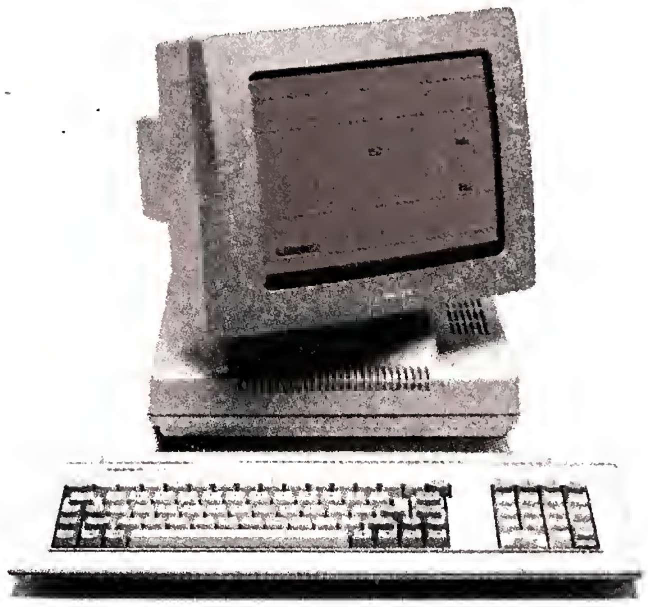
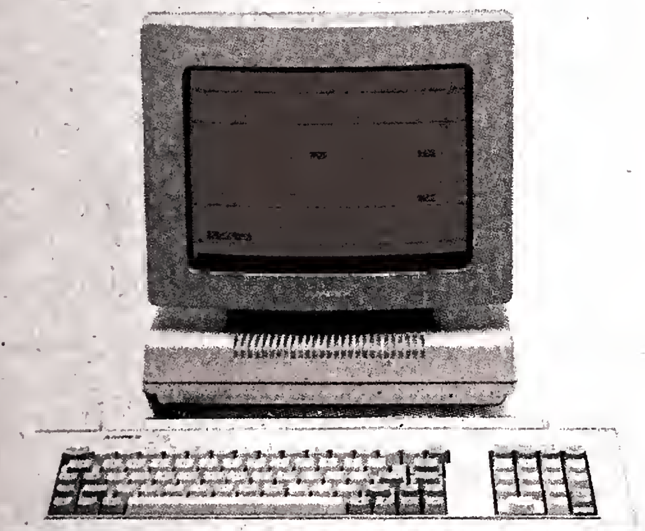
4 We also equipped it with a low-profile, Selectric-style, adjustable-slope keyboard for easy typing.

5 And with a soothing, flicker-free amber screen for easy reading. (If you prefer, you can have the option of green at no extra cost.)



6 But ergonomics are just the beginning. The Ampex 210 is as beautifully engineered inside as outside. With line graphics and a bidirectional printer port as standard features.



10 The Esprit (Hazeltine) 1400, 1410 or 1500*..

11 ADDS Regent 20, 25 and Viewpoint†..

12 And Qume's QVT 102*

16 How can we pack all that into the Ampex 210 for just $549? We're in a position to be competitive. We can take advantage of over 25 years of video, computer peripheral and offshore manufacturing experience.

17 So if you need a well-designed, full-featured terminal, call us at 800 621-0292. Or 800 821-9473 in California. We'll show you how you can be very comfortably situated for just $549.

AMPEX

18 The Ampex 210 is from the Computer Products Division of Ampex Corporation. One of The Signal Companies

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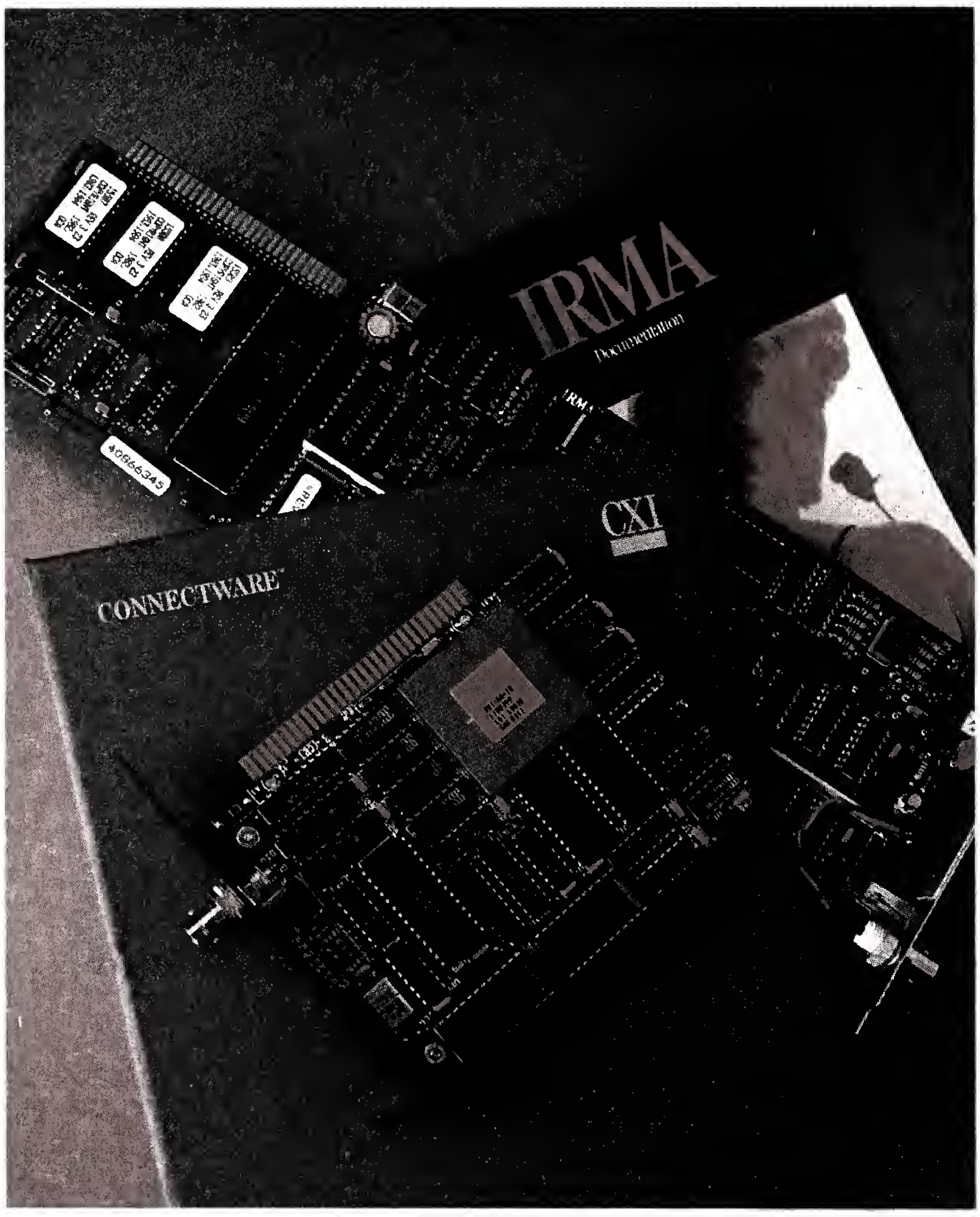
CXI is now compatible with what's-her-name.



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CDC introduces engineering applications systems

MINNEAPOLIS — Control Data Corp. has announced Cybernet*Express engineering applications systems, a series of five software packages designed for IBM Personal Computers or compatibles with 10M-byte Winchester disk drives. The workstations are designed for engineering applications in structures, piping, power systems, electronics design and petroleum reservoir simulation (Resim).

Four of the five packages reportedly incorporate CDC Connect communications software to allow engineers to use the systems in a stand-alone micro environment or to migrate to a local CDC Cyber 800 mainframe or off-site CDC Cyber 205.

The Cybernet*Express Piping System reportedly generates input files for stress analysis, support optimization and analysis drawings for complex piping systems. It costs $7,500.

The Cybernet*Express Power System is designed for stand-alone micro use. It reportedly may be used for design specification and analysis of industrial, commercial and institutional electrical power systems. The Power System software is priced at $8,300.

The Cybernet*Express Structures System is said to be a finite element analysis system that allows design engineers to solve sophisticated structural analysis problems. The Structures System costs $4,500.

The Cybernet*Express Electronic Designer System is said to combine schematic entry and utility software with Personal Computer XT or compatible hardware. It reportedly features design capabilities such as pan and zoom, multiple windows, naming and identification, rubber banding, bus-through points, multiple-width components and net list extraction. It is priced at $7,150.

The Cybernet*Express Resim Access System allows petroleum engineers improved access to the CDC VIP series of Resim software applications running on the CDC Cyber 205. The software is said to provide data entry and editing, automatic dial-up and login procedures that allow the micro user to set up job parameters and I/O files for VIP applications running on the host Cyber 205. Resim Access is priced at $650.

More information is available from Control Data, 8100 34th Ave. S., Minneapolis, Minn. 55440.

GRAPHICS

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resolution film recorder in the service center. The price is considerably lower than the cost of buying your own equipment.

The only catch with enhancement services is that only certain types of graphics can be enhanced — free-form drawings and realistic images often cannot.

For the best of both worlds, there's Presenter PC. It requires some hardware (the higher resolution graphics adapter board) but also provides an enhancement service with a new twist.

Pictorial images and symbols can be added to your charts and graphics via a collection of electronic clip art.

You select the images to be added to your slide and the graphic comes back enhanced up to 8,000-line resolution — complete with the colorful image that you selected.

Nothing is perfect. But for a price that is within the budget of many organizations, microcomputer graphics are able to achieve an appearance that was once reserved for systems costing five to 10 times more.

Enhanced Entrypoint bows

SAN FRANCISCO — Datalex, Inc. has announced an enhanced version of Entrypoint software for data entry on the IBM Personal Computer, Personal Computer XT and Personal Computer 3270.

Version 4.3.1 is said to provide screen-based data entry with unlimited data validation logic, reference data files and Help screens for every field on every form. The new version allows users to move data entry and validation from overloaded mainframes to microcomputers, according to the vendor.

The new features are said to allow users to build self-documenting applications that prescreen data entered by untrained personnel for transmission to the mainframe. Version 4.3.1 reportedly allows data entry at more than 15,000 keystrokes per hour with special keyboard buffering and disk management.

Entrypoint supports single or multiple tree-structured forms, according to the vendor. Its output files are said to be standard PC-DOS files that can be transmitted to the host mainframe with communications hardware or software products, such as Datalex's Passport software.

Entrypoint requires 256K bytes of main memory and 640K bytes of floppy or hard-disk storage.

More information is available from Datalex at 650 Fifth St., San Francisco, Calif. 94107.

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With Add-Ins, Symphony grows as you grow.

Symphony's unique open-ended architecture allows you to expand the functionality of the basic program with Add-In products. These Add-Ins work like Symphony—and with Symphony—so users don't have to learn a new language. Spelling Checker and Text Outliner are already available. And a variety of future Add-Ins and industry specific applications are now being designed by Lotus and qualified third-party developers to further enhance Symphony's capabilities.

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Our micro-to-mainframe link will tie Symphony to your existing environment.

Later this year, Lotus will introduce a new micro-to-mainframe Add-In product. Developed jointly by Lotus and DCA,® this new link will allow designated PC users to transfer data to and from your mainframe computer. Mainframe data will be available on their PC spreadsheets in useable form, eliminating the need for retyping.

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Symphony Software. The more your people do, the more it will do for your people. After all, you wouldn't expect less from the software that was named "Product of the Year"* and easily became 1984's best selling new software product.

For more information on Symphony Software, contact your Lotus Marketing Representative or local authorized Lotus dealer.

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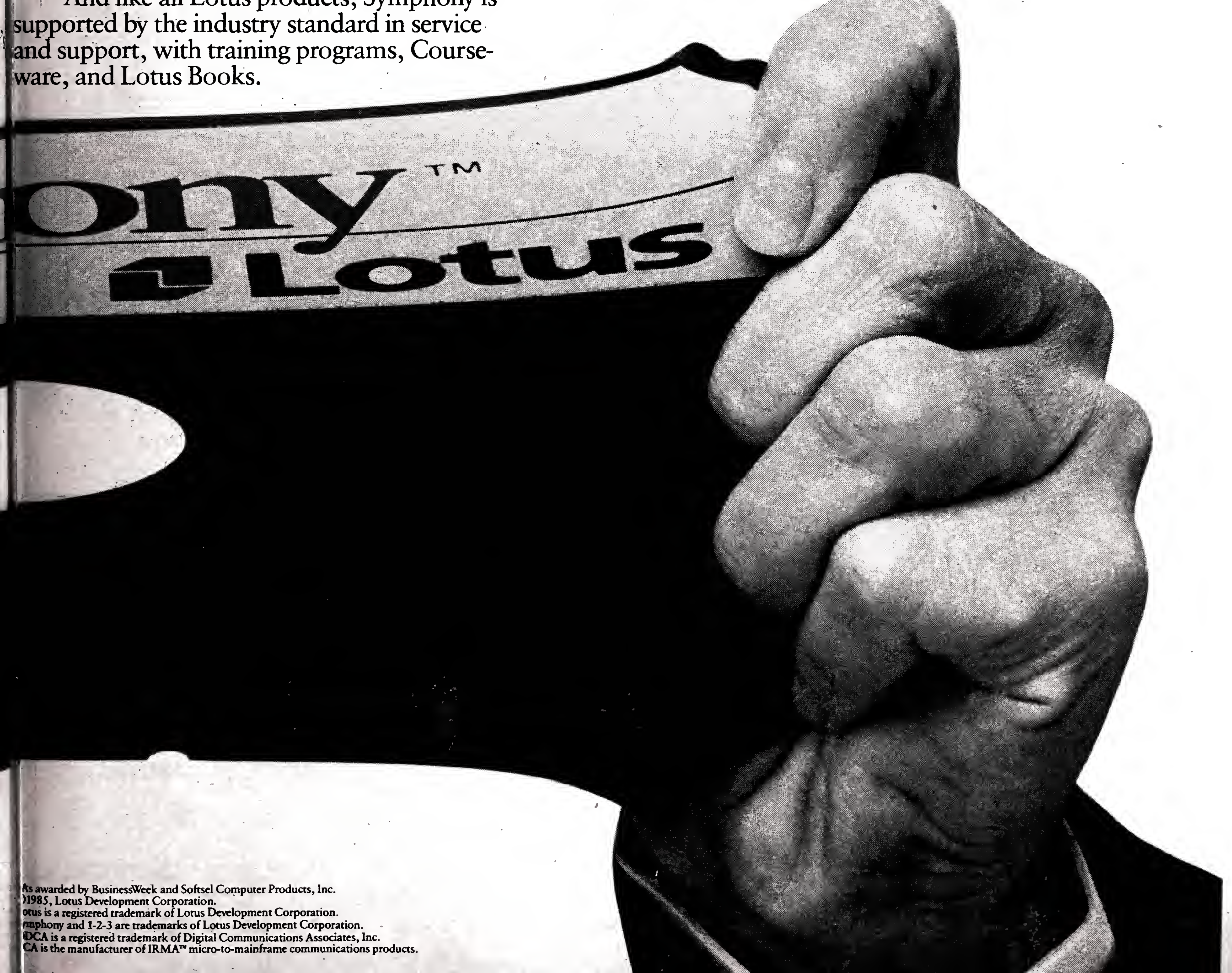

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FALL

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business microcomputer market, IBM believed that it would be able to capture the home and educational markets simply by unleashing a low-priced machine with an IBM logo.

"IBM forgot that when it released its Personal Computer, [the Personal Computer] was a leading-edge product," noted William Bowman, chairman of Spinnaker Software Corp., a Cambridge, Mass.-based educational software vendor.

IBM took a technical step backward when it released the PCjr, which was merely a low-budget Personal Computer. The stripped-down machine was able to run some Personal Computer software but would not threaten its sales.

This attempt was similiar to taking a Cadillac, ripping out some of the extras, lowering the price and marketing it as a competitor to a Volkswagen. Rather than following this approach, IBM should have looked to its own product line.

When IBM noticed minicomputers threatening its markets, it designed new product lines such as its 4300 and System/34. IBM did not strip down its 3033 mainframes and market them as competing machines. Machines must be designed for specific markets and price points.

For whatever reason, $400 to $1,000 seems to be the price range consumers will accept for an electronic gadget. For years, analysts claimed that the VCR market was poised for an explosion. It was only last fall — when VCRs dropped in price to approximately $500 — that the market rapidly expanded.

When the PCjr was first announced, a complete system cost approximately $1,300. Home users will only purchase complete systems — not typewriter-like systems that plug into television sets.

The closest any manufacturer has come to providing this type of system was Coleco Industries, Inc. Priced at approximately $700, Coleco's Adam included a tape drive, word processing software and a letter-quality printer. Coleco realized the importance of the $700 price. The company unsuccessfully tried to solve Adam's technical problems and keep that price.

If consumer price points had been understood at IBM, IBM would have attempted to design a complete $1,000 home computer.

Today, IBM should realize the importance of pricing. When it dropped the price for a complete PCjr to approximately $1,000 last Christmas, the machine became a best-seller. But each machine cost IBM approximately $450, so Big Blue was not making much money, according to Future Computing, Inc., a Richardson, Texas, market research firm.

Some analysts predict that the Personal Computer's price will drop, and it will be positioned to compete at the low end of the market. However, each Personal Computer costs IBM approximately $600, which does not leave sufficient margins to position the machine at the low end.

To reenter this segment, IBM must design a complete computer priced at approximately $1,000.

Will IBM do this? Aaron Goldberg, director of microcomputer system services at International Data Corp. in Santa Clara, Calif., claimed that IBM will introduce a new machine because the educational market is too important for IBM to ignore.

While talk has centered on home computers, few realize that the real treasure buried at the low end of the market is in educational sales. Digital Equipment Corp. propelled itself to its position as the second largest computer manufacturer largely through the university market. When MIT students graduated, they had a thorough knowledge of DEC equipment, and they purchased it for their companies.

Last summer, IBM announced a "Writing to Read" campaign to position the PCjr as a competitor to the Apple and Tandy entries. "IBM must have spent at least $10 million on the Writing to Read program," Bowman said. "That commitment demonstrated how important the educational market is to IBM. I don't think that IBM can afford to abandon that market forever."

TAPE

from page 69

after-write verification with one pass, a method offering greater verification speed than the three-pass method provided by units with one head, according to CMS. The QIC-60 units are said to require two minutes to do mirror-image backup of a 10M-byte hard disk and two minutes, 14 seconds to do file-by-file backup of the same disk.

Both units are said to allow users to back up a file or group of files selectively without typing in a name. By scrolling through the tape directory, users can choose a file or group of files for backup, push one key and have them backed up automatically. When restoring backup data to a disk, the process is reversed.

The Q60H, a 60M-byte tape unit, costs $2,144. The Q60W20, the QIC-60 with 60M-byte tape and 20M-byte hard disk, costs $3,495.

Tecmar is located at 6225 Cochran Road, Solon, Ohio 44139.

WP

from page 69

text formatting information from the original document, including format lines, centering and tabs. No extra return characters are added to the converted file.

Transfering documents between the micro and the mini requires separate communications tools.

The conversion program is free to current Multimate users and is not for sale.

Multimate International is located at 52 Oakland Ave. N., East Hartford, Conn. 06108.

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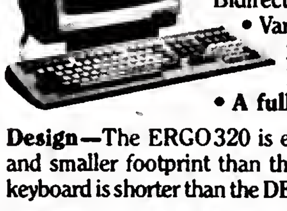

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*(Turn Page Upside Down for Answers)

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TI from page 69

tasking version of the Business-Pro, running Microsoft's Xenix, reportedly will be available in the third quarter.

The basic single-user Business-Pro will include the system unit, keyboard, serial/parallel interface and a 1.2M-byte diskette drive. An enhanced model will have the features of the basic machine and a 21M-byte hard disk drive. Users may choose from a variety of data storage configurations, including 360K-byte or 1.2M-byte diskette drives; 21M-, 40M- or 72M-byte hard disk units; and/or a 60M-byte cartridge tape backup system.

The Personal Computer AT-compatible version of the Business-Pro will also debut in June and will feature a 1.2M-byte diskette drive, 21M-byte hard disk and a Personal Computer AT-mode CRT controller.

Network server versions to be available

Two network server versions of the Business-Pro will also become available in the second quarter. Each reportedly will include the 512K-byte system unit; a 128K-byte expansion board; high-resolution color monitor; Novell, Inc. Netware software; MS-DOS 3.0; and 3Com Corp.'s Etherlink network hardware.

As a network server, the Business-Pro will support up to 50 personal computers sharing up to 144M bytes of disk storage, a 60M-byte cartridge backup system and up to three printers, TI said.

Other options for the Business-Pro include a tilt-and-swivel monitor with a 13-in., bit-mapped display, the Intel 80287 math coprocessor and two user interfaces — the mouse pointer and TI's Speech Command speech recognition system.

The single-user Business-Pro will be priced at $3,995; the enhanced model will cost $5,795. The Personal Computer AT-compatible configuration carries a price of $6,040. The AT-mode CRT controller alone will be priced at $495 and reportedly will operate in any of the other configurations of the Business-Pro. Other configurations are priced from $4,440 to $10,785, based on user's choice of storage devices.

Prices for the network server version of the Business-Pro are $12,200 for a model with a 40M-byte hard disk and $13,700 for one with a 72M-byte hard disk.

TI's Data Systems Group can be reached through P.O. Box 809063, Dallas, Texas 75380.

AI from page 69

cision makers to develop a decision tree, a graphics model that depicts various alternatives, or decision paths, as its branches. Decision trees allow a decision maker to structure a problem and choose the best alternative. They are useful in deciding such matters as capital outlays, pricing policies and whether to lease or purchase.

Priced at $595, Arborist reportedly lets the user assign values and probabilities to each aspect of the decision; then the software determines each alternative's expected final value. The software uses windows to divide the screen's work area.

Arborist reportedly requires 512K bytes of internal memory and a high-resolution display that can display three-plane graphics.

Naturallink improved; price cut

TI enhanced its Naturallink Technology Package and dropped the package's price to $1,500 plus royalties. Reportedly among the enhancements of Release 1.75 are a faster runtime for its screen management utility and improved editing capability. Also added was an improved interface builder.

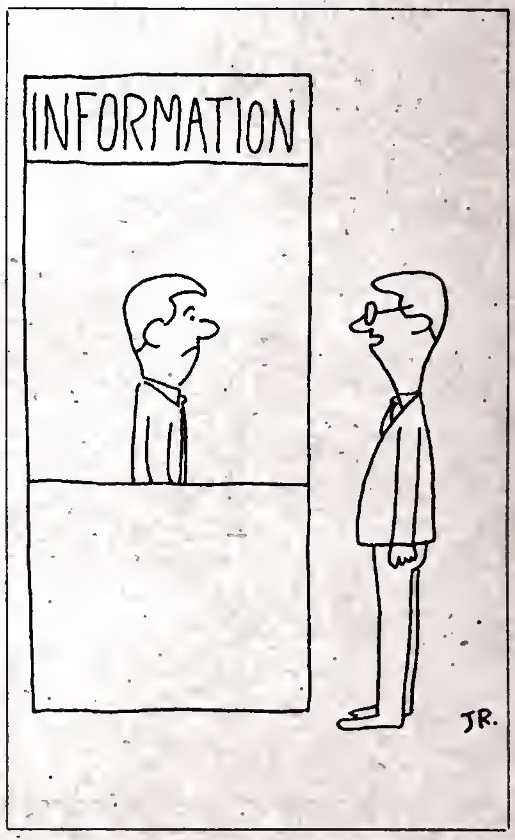
The speech capabilities introduced for the TI Professional are provided on an option card that reportedly offers multiple voice recognition modes, selectable voice digitization rates and text-to-speech capability.

Text-to-speech capability reportedly permits screens of English language text to be translated into synthesized spoken English. The board will be offered in the $995 TI Speech package, which also includes a microphone, external speaker and diagnostic software.

Also unveiled was Phone Manager software, which permits the TI Speech package to initiate and answer telephone calls. With a telephone interface board and telephone cable, the software costs $350.

TI's Data Systems Group can be reached through P.O. Box 809063, Dallas, Texas 75380.

— **Edward Warner**



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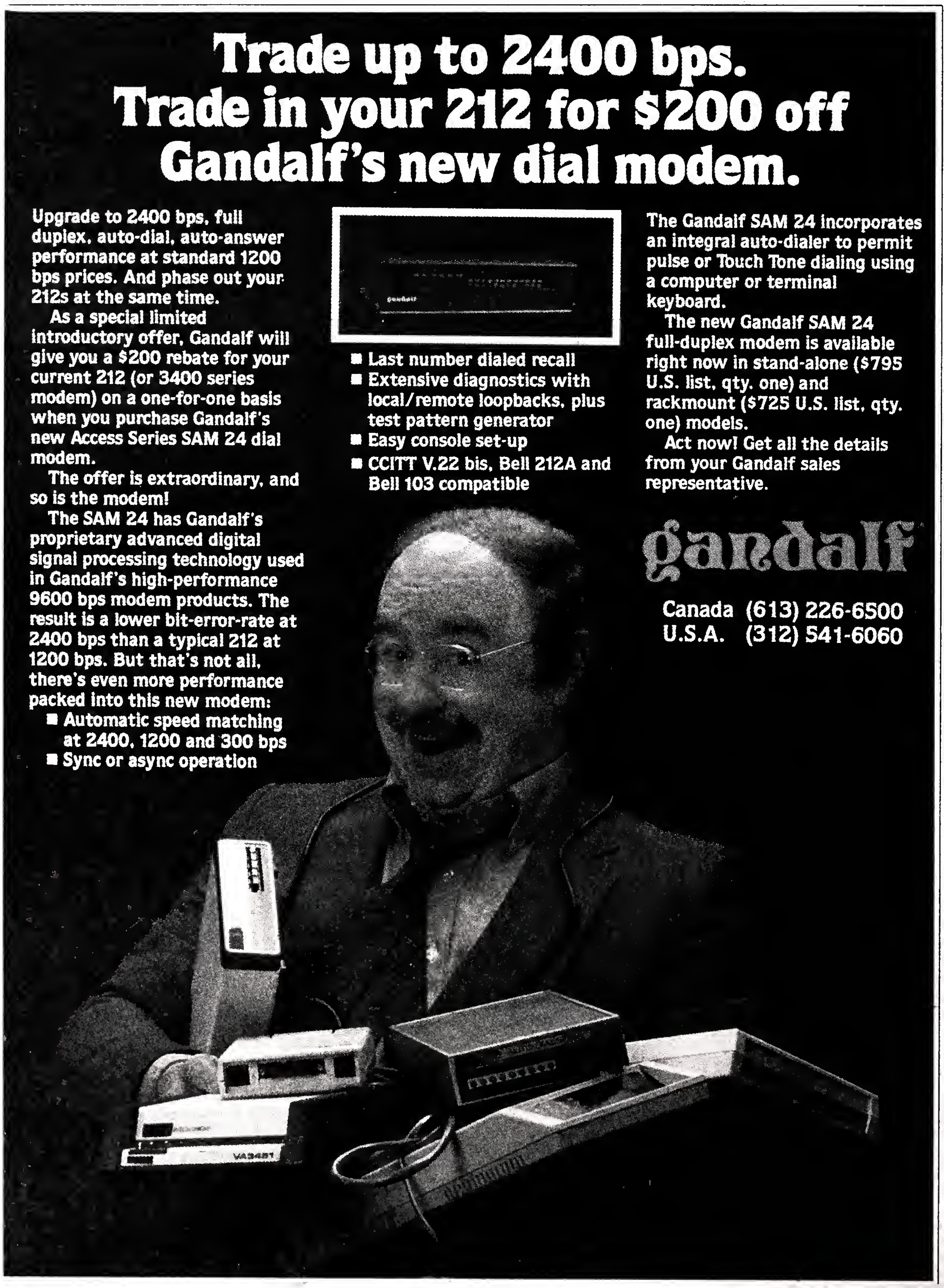
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COMMUNICATIONS

Backup needs merit attention

WIRE TAP
Daniel Minoli

Major disasters that can put a large organization out of business happen more often than one would like to believe. The threats include fires, floods and physical security infractions of a criminal or terrorist nature.

The issue of backing up a data center has received considerable attention in the past few years, but less attention has been given to the communications system that would support a postdisaster backup site.

Recovery systems for communications vary by application. Clearly, if the communications requirement is centralized, as in a large batch environment where all major users are close to the system, the likely solution will differ substantially from the solution for a geographically distributed, transaction-based teleprocessing network.

When planning for disasters in a distributed DP environment, a regional center may be nominated as the backup site. In a centralized DP environment there are several options: construction of an alternate site; use of a corporate parent or sister division's data center; or use of a disaster recovery service. The first option requires choosing a location. Should the site be some nearby suburban site for both staffing and communications reasons?

Several communications technologies can accommodate access to the alternate site from the dispersed population of users:

■ Packet-switching networks provide access to the alternate site by making

See **SITE** page 96

Minoli is an associate vice-president, systems planning and engineering, of Prudential-Bache Securities in New York.

Local Data releases enhanced converter, emulation packages

ATLANTA — Local Data, Inc. has announced an enhancement for its Versalynx/3278 Model 3 protocol converter that offers customer-definable terminal personalities. The company also announced file transfer support for the Data General Corp. DG/One personal computer and the IBM 3270 Personal Computer.

A spokesman said Versalynx/3278 Model 3 allows an IBM 3278 or equivalent terminal to emulate any of five factory-provided Ascii terminal personalities or customer-definable terminal personalities. A Model 3 user can define both the output sequences and the keyboard key sequences making up each 3270 key function. The defined personality can be transmitted from one Model 3 to another Model 3, Model 2 or Model 1 Versalynx/3278 as well as uploaded to Ascii mainframes for subsequent downloading to other Versalynx units.

Versalynx/3278 Model 3 costs $795 for stand-alone units.

With Filelynx/3278-PC software, a DG/One workstation allows the device to appear to the host as either an IBM 3278 or 3287, or as both devices on one communications channel when used with the company's Datalynx/3274 or Interlynx/3278 protocol converters. Filelynx/3278-PC costs $200 for the first copy and $100 for each additional personal computer. An unlimited-use license costs $1,000.

The Filelynx/3270-PC software makes an IBM Personal Computer, XT, AT, PCjr or compatible microcomputer, such as AT&T's 6300, function like an IBM 3270 Personal Computer using the Datalynx/3274 or Interlynx.

Filelynx/3270-PC costs $300 for the first copy, $200 for each additional personal computer and $15,000 for a single-customer unlimited-use license.

Finally, Local Data announced Datalynx/3274 Release 2.31 for 3270 bisynch-

See **LOCAL** page 94

IBM controller only product for T1 nets

By John Dix
CW Staff

Although 1.54M bit/sec T1 digital communications facilities can be used in IBM networks today, the only product the mainframe manufacturer has announced that enables these links to be controlled within its network architecture is an adapter for its 3725 Communications Controller.

The high-speed adapter for the 3725 was announced last September but will not be shipped until the third quarter of this year. It will reportedly enable users to transfer data between hosts through 3725 front-end processors at speeds up to the maximum T1 rate of 1.54M bit/sec.

Initially tariffed last year, T1 can offer an economical alternative to individual leased lines for large users who have enough data or voice traffic between two points to justify the wide-bandwidth digital pipe.

But the only way T1 links can be used within IBM environments today is by placing T1 multiplexers in front of IBM's 3705 or 3725 Communications Controllers. In this type of configuration, the capacity of a single T1 link can be subdivided into multiple channels operating at different speeds, with the maximum single-channel speed being 64K bit/sec, the fastest rate supported by the IBM communications processors.

IBM does not offer a T1 multiplexer, nor does its Systems Network Architecture (SNA) recognize other manufacturer's T1 multiplexers. This cripples, to some degree, IBM's diagnostic programs. "If you want to keep your end-to-end problem diagnosis and troubleshooting via IBM software, then you have to use IBM products," according to George DeSalvo, director of Communications Technology Service for the Washington, D.C., office of International Data Corp., a Framingham, Mass.-based research firm.

Although IBM's host-based programs such as the Network Problem Determination Application can monitor and control remote IBM hardware through T1 multiplexers and facilities, the programs are blind to the condition of the multiplexers

See **T1** page 97

■ Forest Computer has announced a communications processor that is said to be a gateway to the IBM SNA network for non-IBM terminals and printers/**92**

■ KMW Systems has announced a device that reportedly allows the attachment of up to seven parallel or serial asynchronous devices to IBM System/34, 36 or 38 machines/**92**

■ Universal Data Systems has introduced its 14.4 Trellis modem, which is said to operate at 14.4K bit/sec over unconditioned private lines/**94**

INSIDE

Controllers/**92**
Voice/Data Communications/**92**
Protocol Converters/**92**
Software/**92**
Multiplexers/Modems/**92**
Local-Area Networks/**97**

Network puts data at immigration agency's fingertips

WASHINGTON, D.C. — Nearly 200 million immigrants and visitors pour across the borders and through legal entry points each year to enter the U.S.

The Immigration and Naturalization Service (INS) here, chartered with the investigation of noncitizens who come into the U.S., determines whether an immigrant shall be granted citizenship.

The INS also investigates temporary workers, diplomats and other visitors who want to live in the country for a length of time. The service runs the border patrol, intelligence operations, investigations, deportation proceedings and detention facilities.

Keeping track of this continuous information flow is a huge job. Yet only two years ago, the INS manually registered immigrants and visitors, processed naturalization cases, followed the movement of aliens and checked a lookout hot list of terrorists and saboteurs.

To improve the agency's timeliness and accuracy, in the fall of 1982 the INS began investigating the possibility of using a data communications network to tie its 110 regional offices into two central data bases, according to John Murray, associate commissioner of information for the INS, who was responsible for the investigation and eventual implementation of the net.

Installed network

By the fall of 1983, INS had installed a Tymnet, Inc. network that enabled its regional offices to enter and retrieve information on individuals from the central data bases.

The system employed to track undesirable aliens is currently being installed in major air and sea ports in the U.S. It is also being placed at checkpoints in foreign ports.

Unlike the old lookout book, this system has a response time of three to five seconds and can be updated instantly.

Originally, INS used Tymnet's public network, but as the INS increased its reliance on the service, a fully dedicated custom network evolved, which Tymnet will manage.

Currently, the INS has two major data centers, one in Washington, D.C., and the other in Dallas. These centers have a combination of various size packet-switching nodes, including Tymnet Engines, Mini-Engines and Micro-Engines.

Tymnet has also furnished modems and lines for the system. The total milege of the lines in

See **INS** page 94

CONTROLLERS

■ Forest Computer, Inc. has announced the 1KS/SNA communications processor that is said to be a gateway to the IBM Systems Network Architecture (SNA) network for non-IBM terminals and printers.

The 1KS/SNA hardware reportedly consists of a Hewlett-Packard Co. HP1000 A series minicomputer and Programmable Serial Interface (PSI) cards. The software in the A series handles SNA control, frame processing and data stream conversion, according to the vendor. The PSI cards are reportedly programmed to handle a variety of protocols.

The product is capable of allowing more than 1,000 terminals to communicate with both IBM and non-IBM hosts, according to a spokesman.

The Forest 1KS/SNA software is priced at $35,000, and hardware prices also begin at $35,000.

Forest Computer, 1749 Hamilton Road, Okemos, Mich. 48864.

VOICE/DATA COMMUNICATIONS

■ General Datacomm Industries, Inc. has announced the Datx Integrated Office System (IOS) hardware for transmitting voice and data simultaneously over existing twisted-pair telephone wiring.

The Datx IOS system includes Datx 2000 line interface units and the Datx Switching System. Datx 2000 desktop units provide an RS-232 interface and support transmission of asynchronous and synchronous data at speeds up to 19.2K bit/sec at up to 8,000 feet. The Datx Switching System provides links for up to 1,320 terminations, expandable in 24-channel increments from a base capacity of 360 lines.

Datx IOS costs $11,000.

General Datacom, Rt. 63, Middlebury, Conn. 06762.

PROTOCOL CONVERTERS

■ Fibronics International, Inc. has announced Pascii, a line of four protocol conversion tools.

FC3000 provides an RS-232 attachment to an IBM 3274 controller or 4331 Display Printer Adapter. A pass-through feature supplies communications to an Ascii host.

FC3008 converts up to eight 3274 coaxial ports to RS-232 ports which can be used to support Ascii terminals, printers and personal computers. The product enables each terminal to be configured for IBM 3278 or 3279 terminal emulation.

FC3001 enables a user to attach an IBM 3278, 3279, 3178 and 3179 terminal to an RS-232 line. With the product, a user connects directly to a 3274 controller.

FC3500 allows an RS-232 serial or parallel printer to be attached to an IBM controller. The product uses a generic print mode to support any hard-copy device, the vendor said.

The RS-232 port supports transmission speeds from 300 to 9.6K bit/sec. Product prices range from $500 to $1,000 per port.

Fibronics International, 325 Stevens St., Hyannis, Mass. 02601.

■ KMW Systems Corp. has unveiled the Series II+ Twinax protocol converter that reportedly allows the attachment of up to seven parallel or serial asynchronous devices to the IBM System/34, 36 or 38.

The Series II+ Twinax communicates with the host system via standard twinaxial, two-conductor shielded cable. The device emulates a 5250 Model II terminal or a 5225 printer. The converter has the cable-through feature used with the peripherals in these processor families, enabling it to be used as a station on cable stringing together many devices or as an interface.

The product supports any combination of parallel and asynchronous RS-232C devices, but at least one of the ports has to be asynchronous.

The Series II+ Twinax costs $1,995 for a single port converter and $550 for each additional port.

KMW Systems, 8307 Highway 71 W., Austin, Texas 78735.

SOFTWARE

■ Motorola/Four-Phase Systems, Inc. has introduced communications software that allows its Series 4000/5000 minicomputers to communicate with Wang Laboratories, Inc. word processing systems.

Word-Share allows the two systems to communicate via RS-232 connections or remotely over telephone lines. Documents can be transferred in both directions. Centering, tabs and underscoring WP functions are maintained during the exchange.

Word-Share is priced at $3,000.

Motorola/Four-Phase Systems, 10700 N. De Anza Blvd., Cupertino, Calif. 95014.

MULTIPLEXERS/ MODEMS

■ Nokia-Kinex Corp. has introduced its 48/208AB Models 2 and 3 modems that operate as either an AT&T 208AB or as a 201C modem.

Model 2 offers manual selection of 208AB or 201C modes and Model 3 offers automatic selection of the modes. Features include autospeed detection and leased/switched operation selectable from the front panel.

Prices start at $1,195.

Nokia-Kinex, 6950 Bryan Dairy Road, Largo, Fla. 33543.

See **MUXES** page 94

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CW

MUXES from page 92

■ **Nokia-Kinex Corp. has announced its 48/27 4.8K bit/sec modem, said to be capable of operating on both domestic and international circuits over leased and dial-up facilities accommodating point-to-point or multipoint networks.**

An echo protect feature reportedly allows operation over satellites. The modem is said to be fully compatible with CCITT V.27. The 48/27 provides independent two-wire and four-wire line interfaces for simultaneous connection to both leased or dial-up facilities, the vendor said.

Features include fallback to 2.4K bit/sec, automatic antistreaming alarm, unattended autoanswer/disconnect capability and local and remote controlled diagnostics.

The unit costs $2,100.

Nokia-Kinex, 6950 Bryan Dairy Road, Largo, Fla. 33543.

■ **Universal Data Systems has introduced its 14.4 Trellis modem, said to operate at 14.4K bit/sec over unconditioned private lines.**

The modem, which uses trellis modulation, comes in both a standalone package and a 58-sq-in. card. It includes an automatic adaptive equalizer that is said to compensate for line distortions without the need for manual strapping of preequalizers. The modem provides for fallback rates of 12.2K bit/sec and 9.6K bit/sec and is CCITT V.29-compatible at 9,600 bit/sec.

The price of the 14.4 Trellis standalone modem is $3,950. The card version costs $1,530.

Universal Data Systems, 5000 Bradford Drive, Huntsville, Ala. 35805.

■ **Astrocom Corp. has announced its Asim-3 statistical intelligent multiplexer that multiplexes data from three asynchronous terminals onto one line at synchronous speeds up to 9.6K bit/sec.**

The multiplexer features a menu-driven screen that allows the network manager to set all multiplexer parameters from a terminal keyboard rather than using internal switches and straps, the vendor said. A remote setup capability allows the selection of parameters from any customer-selected location. The three-port system costs $640.

Astrocom, 120 W. Plato Blvd., St. Paul, Minn. 55107.

See **MUXES** page 96

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INS from page 91

the network has increased from 500 to 32,000 circuit miles in the past year.

Last year, of the 200 million individuals who were inspected, 1.2 million were apprehended for entering the country illegally.

On a record inspection day, 3,500 entrants were apprehended, according to Murray.

Naturalization process begins

The naturalization or permanent resident procedure starts when an applicant first enters the country and fills out a standard form that requests basic information. This information is then fed into one of the INS' data bases.

The central data base contains 60 million records on 18 million individuals.

"The Tymnet custom network will simplify and expedite the naturalization process and give us positive control," Murray said.

"In the past, without the data communications and centralized data bases, it was possible that we would try to naturalize a person in one city when he was scheduled for deportation in another city," Murray continued.

Even before the installation of the network, the INS was working to improve the rate at which aliens are naturalized. The backlog is still 1½ to two years.

"The optimum would be about six months from the time they apply to when they are eligible," Murray said.

Antismuggling data base

Some of the more complex files in the data base involve law enforcement. An antismuggling data base is currently used to prevent the smuggling of people.

The system is cross-referenced by aliases, soundalike names, alternate spellings, telephone numbers, addresses and relationships.

INS employees can search this data base in approximately 80 seconds.

"We stopped 37,000 smugglers last year," Murray said.

A number of states, including California and Colorado, have contracted with the INS to tie in to certain parts of the INS data bases to check whether an alien is legally eligible for government benefits.

Before the distributed network existed, there was no link between the INS and the states.

"The state clerks had to send the forms to us and hope to get them back," Murray said. "They were stacked up in a lot of offices, and the volume was more than we were able to handle."

LOCAL from page 91

ronous emulation. According to a spokesman, Release 2.31 enables the user to add up to three personalities to the emulation package of more than 50 standard factory-configured terminal personalities.

Datalynx/3274 is available in three to nine ports, in Binary Synchronous Communications or Systems Network Architecture. The product costs from $3,000 to $9,000, depending on model and number of ports.

Local Data is located at 2771 Toledo St., Torrance, Calif. 90503.

IBM ON TELECOMMUNICATIONS

Q. IF A MODEM IS A MODEM IS A MODEM, DOES IT REALLY MAKE A DIFFERENCE WHICH ONE I BUY?

A. The fact is, all modems are not created equal. For example, some modems are better signal processors than others. And these superior modems can make an important difference in your total network performance. A difference that can lead to important savings in telecommunications costs.

Q. How can a modem make a difference in my telecommunications costs?

A. The primary purpose of a network is to move information to and from end users and thereby improve their productivity. And a superior modem can improve the performance of your network in at least four areas: It can make your network more reliable. Give your end users faster response times. Minimize the time you and your people spend on network management. And a superior modem can also save you money in line charges.

Q. What makes a superior modem?

A. As you know, a modem converts a data stream into a signal that can be sent (usually over a phone line) from Point A to Point B.

Now that may sound simple enough, but there are a number of variables in that seemingly simple scenario. Such as, what's the distance between Points A and B? What's the line between the points? What's the condition and stability of the line? And many, many more. The point is, each variable carries technical implications that affect the design of the modem. And simply stated, a superior modem enjoys a superior design.

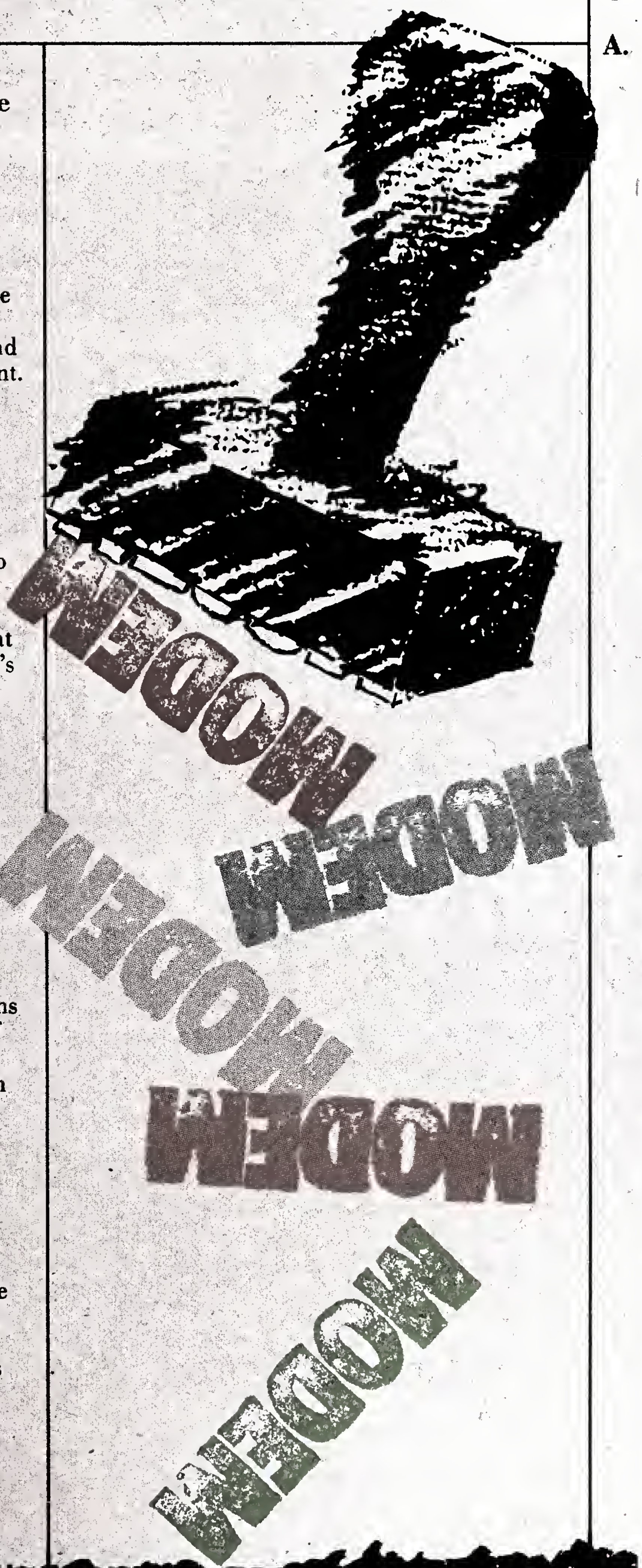
Q. Be specific. How can a superior modem save my company money?

A. Let's face it, modems are not the most expensive part of your telecommunications network. Chances are, line charges are. If you design a modem that can send data more reliably, then that modem can begin to affect your line charges. Every time a modem has a "hit," or an unsuccessful transmission of data, the data must be retransmitted, slowing down response time. The net effect is a reduction in the amount of information carried by the network.

If you use superior modems that give fewer hits, you'll have lower line costs per data unit transmitted and better throughput. Better throughput translates into time and cost savings.

Q. Can a superior modem correct the problem of faulty lines?

A. A superior modem can go a long way toward compensating for poor line conditions—and thus make marked improvements in the hit rate.



Take the IBM 3865 Modem, for example. It contains a custom microprocessor with an advanced algorithm that in effect enlarges the target area of acceptable transmissions. The result is that this reliable 9,600 bps modem can operate very effectively over unconditioned lines. Now imagine all the line conditioning charges you won't have to pay your common carrier.

Q. How can I go about proving the superiority of IBM modems?

A. Take your most troublesome line and put IBM modems on it. We believe you'll see an impressive improvement. Which leads us to another benefit of superior modems—you'll spend less time troubleshooting your network simply because line conditions that once were considered problems aren't really problems any more.

There are a number of other good reasons why you should consider IBM's line of 2,400, 4,800 and 9,600 bps stand-alone and rack-mounted modems. Not the least of which is that we've recently announced two new modems—the IBM 3833 and 3834—which feature lower prices, smaller packaging and improved serviceability. And like all IBM modems, they can fully utilize IBM's Communication Network Management capability.

The New IBM Modems

	IBM 3833	IBM 3834
Transmission Speed (bps)	2400 (full speed) 1200 (half speed)	4800 (full speed) 2400 (half speed)
Compatibility	3833, 3863-1,* 3868-1	3834, 3864-1,* 3868-2
LED Diagnostic Indicators	standard	standard
Communication Facilities	4-wire, point-to-point or multipoint	

Both modems operate over nonswitched telephone lines that can be leased (common carrier or PTT) or private.

*Must be in native mode. For full diagnostic capability, must be equipped with the Extended Diagnostic feature.

What's more, we've also recently lowered the prices of the IBM 3863, 3864, 3865 and 3868 Modems by as much as 29 percent. And there are also volume discounts available. If you're looking for modems that offer reliability, can improve end user productivity and are competitively priced, talk to your IBM marketing representative.

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SITE from page 91

that site a major network node.

■ With two-way, direct broadcast satellite networks — consisting of dispersed small dishes and a master earth station usually connected to the CPU site via a set of leased lines — provision of alternate access is achieved by connecting the alternate site to the master earth station using a duplicate set of leased lines.

■ In a teleprocessing network with major concentrator nodes, provision of alternate access is achieved by connecting the concentrators — presumably a small number — to the alternate site via duplicate leased lines.

Cost factors

The cost of the solution will be greatly influenced by the speed of recovery desired. The most practical approach is to postulate a target recovery time of 24 hours. A one-hour requirement would increase the cost considerably; a three-day requirement would lower it.

The practical approach is to relax all such parameters to a lower, but not unreasonable, level of expectation. For example, a two- to five-second normal response time may be relaxed to 10 to 15 seconds.

In the throughput area, consider what flows and applications are really crucial to the business, and limit all others for the duration of the contingency. In addition, it may be possible to temporarily replace some data flows with tape transfers, dial-in facilities and so forth. Systems development staff may be moved to the new location.

Other design factors will also affect cost. Can backup equipment be located on company premises, or must it be placed off-site? What are the secondary risks? Will postdisaster facilities that may be affected by the contingency, such as bypass technologies, local networks and private branch exchanges, also be used?

Issues that also must be considered include the following: How extensive will the damage be? What safety systems are in place? How conservative should the backup technology be? How important, feasible or desirable is reusability of disaster facilities for nondisaster use?

Basically the costs associated with contingency planning and actual disasters are composed of three elements: initial costs, recurrent costs and cost at recovery.

Naturally, a solution that has a low initial cost, low recurrent cost and low cost at recovery would be most desirable.

In practice, the situation is more challenging. A solution with low initial cost — for example, use of dial-up lines for backup — would involve a higher cost at recovery. A solution with higher initial cost, such as alternate dedicated lines, would entail no cost at recovery. A solution with low recurrent cost, such as high-capacity multiplexers, would cost more initially.

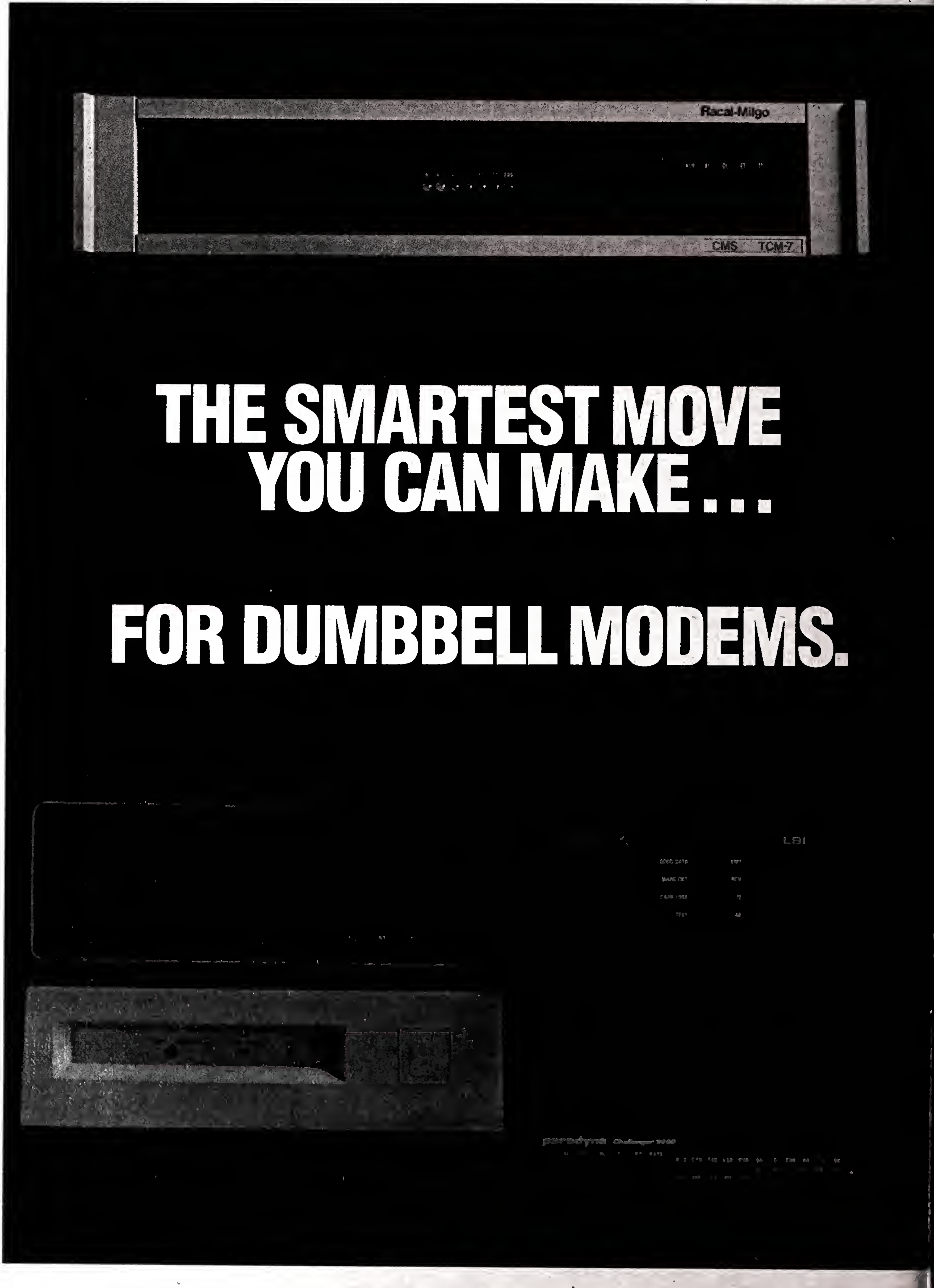
"You might see better if you took off the dust cover!"

MUXES from page 94

■ **Timeplex, Inc. has announced Prophet Network Manager software that runs on the IBM Personal Computer XT and provides configuration and management capabilities for the company's Link/1 T1 multiplexer.**

Prophet Network Manager is said to assist in designing, implementing and controlling private integrated digital networks for voice, data, video and digital facsimile information streams.

The software provides menus and prompts for all control functions of Link/1, including the ability to configure port and data link parameters; make clock selections; execute system commands; conduct diagnostic routines, such as hardware and firmware tests; count statistics that indicate the quality of T1 transmission facilities in the network; and display any alarm condition on operator request.



The Link/1 Prophet Network Manager software is priced at $1,500 and is compatible with Link/1 models L1340 and L1840.

Timeplex, 400 Chestnut Ridge Road, Woodcliff Lake, N.J. 07645.

LOCAL-AREA NETWORKS

■ **Applitek Corp. has announced Lantest software, said to enable users to measure response time and throughput of the company's Unilink local-area network as the load is increased to 100%.**

Lantest shows the effect of running a network under different access methods, including carrier-sense multiple access with collision detection (CSMA/CD), token passing or Unilink. Unilink is said to combine CSMA/CD response with the access of token-passing systems.

Reportedly, Lantest includes a starter kit consisting of four Applitek network interface units, software and an appropriate baseband, broadband or fiber-optic cable. An IBM Personal Computer or compatible micro with 128K bytes of memory and a serial RS-232 port is required.

The price for Lantest software is $2,000.

Applitek, 107 Audubon Road, Wakefield, Mass. 01880.

T1

from page 91

and the T1 link connecting them. This is because "IBM's Byzantine set of systems management programs for communications require the device that they work with — down to the controller and terminal level — to have microcode, hardware or something built in that can respond to a diagnostic inquiry," DeSalvo said. "IBM's software can't interrogate T1 multiplexers."

IBM's high-speed adapter for the 3725 does not provide the full functionality of a T1 multiplexer, but it can provide a high-speed connection between remote hosts or between a host and a 3725 configured as a remote concentrator under the full control of SNA. "SNA does the multiplexing for you over the T1 link, carrying on multiple sessions on a given trunk," said Francis X. Dzubeck, president of Communications Network Architects, Inc., a consulting firm in Washington, D.C. "The T1 trunk is just acting like a digital pipe."

Use of the 3725 adapters and T1 facilities to interconnect computer sites might be justified by the volume of data required or by application. Although DeSalvo said that you need a "tremendous amount of traffic to justify T1," Dzubeck pointed out that in the SNA Distribution Services and Distributed Office Support Systems environments, moving documents — which may contain graphics — between locations can eat up a lot of bandwidth.

Adapters may be necessary

Where it is desirable to transfer files between remote processors faster than the maximum 64K bit/sec channel rate supported by IBM's 3705 and 3725, the high-speed adapter may be the only alternative; host computers do not have the intelligence to break a file down to send it out through multiple 64K bit/sec T1 multiplexer channels, according to DeSalvo.

The other primary application for the T1 communications controller adapters is the support of remote 3725s that are acting as concentrators for a cluster of hardware. "If your computer was in [Tampa, Fla.], you could have a 3725 in Cleveland acting as a giant intelligent controller supporting the whole Midwest," DeSalvo explained.

IBM uses 3725s in this manner in its Information Network, DeSalvo noted, although it does not currently interconnect the communications processors with T1 facilities.

The traffic needed to justify the hardware — the 3725 adapters cost roughly $100,000 on a request-for price-quotation basis — and the T1 links in a remote concentrator configuration is higher than in host-to-host applications. "The whole idea of why you front-end something in a remote city is to reduce that traffic, and once you do that, often you no longer have 1.54M bit/sec to transmit," DeSalvo said. "It's like the old adage: 'What am I going to do with one elephant?'

'Well, I'll sell you two.'

'Okay, now you're talking.' "

You don't have to replace your modems to take control of your network.
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SYSTEMS & PERIPHERALS

Prime 9955 earns early user's praise

By Donna Raimondi
CW Staff

DANBURY, Conn. — "I was optimistic going into it, but I was totally floored when I saw the results," said one of the first users of Prime Computer, Inc.'s 9955 superminicomputer, who claimed the firm's recently conducted benchmark tests exceed Prime's performance claims for the system.

The Comstock Group, Inc. here installed its 9955 on Friday, March 22, and performed benchmark tests of its payroll application program on the following Saturday, according to Cynthia McFarland, the firm's DP manager. The program, which processes payroll records for the firm's 1,000 employees, took nearly 6½ hours to run on Comstock's Prime 750. McFarland said the package ran in just under 1½ hours on the 9955. In previous benchmarks run on a Prime 9950 at Prime's Natick, Mass., headquarters before the 9955 was available, the program ran in just under 2½ hours, she said.

McFarland had expected less dramatic results. Prime told potential users of the machine that if they were running Fortran 77 programs, they could expect a 60% increase in performance over the 9950 model, she said. Fortran 66 users — like Comstock — were told to expect a 30% increase in speed, which was considerably less of an increase than what actually happened in the benchmark tests, she said. "If we move to Fortran 77 now, it will be phenomenal," she said.

Comstock Group's information system needs grew rapidly as the company expanded through acquisitions and start-up companies, said Charles McFarland, vice-president and treasurer of the firm, which was originally founded as L. K. Comstock & Co. in 1904.

The Comstock Group — a holding company with several subsidiaries — is engaged in electrical and mechanical construction, communications and engineering, he said.

Comstock removed the payroll application and a labor distribution package that goes hand in hand with the payroll from its two IBM System/3 Model 12 minicomputers and placed them on a Prime 750 about 1½ years ago, he said. The company had ordered a Prime 550 to back up the 750, but because the payroll and labor distribution packages were becoming so immense, it became apparent that they would outgrow the combined capacities of the 750 and the 550 too fast, he said.

Applications requirements and the number of users had increased so rapidly that the planned system was inadequate even before it was delivered, he said, and

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■ Sony Communications Products unveiled a line of videotex products/**100**

■ Uniq Digital Technologies enhanced its PDP-11-based minicomputer/**102**

■ Topaz announced a microprocessor-controlled line of power conditioners for minicomputers and other devices/**106**

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SHOP TALK
David Friend

Graphics boom affecting MIS

Managers are realizing that the ability to compress, track and control vital information gives them a cutting edge in today's business environment. MIS departments can help managers hone this edge with computer graphics systems that allow them to access information quickly and easily — information displayed in a graphics format that is instantly recognizable and useful.

Many MIS departments are now beginning to formulate systems to supply managers with the information they need in the formats that they desire. The MIS department traditionally served primarily the financial and accounting functions of the organization. These functions called for massive reports that detailed transactions and financial conditions. That role has changed.

Managers are not interested in wading through long printouts. Instead, they want to be able to capture the information they need quickly and graphically. In many companies where the MIS department is not supplying them with the information, managers are learning to access it independently on their desktop systems.

The MIS department must keep in mind that managers are information users, not information analysts. They do not manipulate information — they have people to perform that function. What they do need is improved access to the information that allows them to carry out their decision-making responsibil-

See **MANAGE** page 106

Friend is chairman of Pilot Executive Software, Inc., a Boston-based developer of executive information systems.

Burroughs MICR unit debuts

DETROIT — Burroughs Corp. has unveiled the DP 1800, a document processing system aimed at financial users.

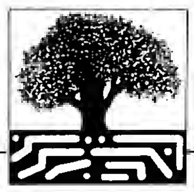
The DP 1800 is a magnetic ink character recognition (MICR) system designed to process up to 1,825 documents/min and communicate with Burroughs' B2900, B3900, B4900 and V series of processors. The unit is said to have local intelligence that, when combined with a parameter-driven fine-sort program, allows the unit to execute sorting decisions without using host processor resources.

The DP 1800 is also reportedly capable of endorsement printing, microfilming and captured data formatting without host intervention. These capabilities, the vendor said, can reduce the DP 1800's dependence on the host system by up to 15%.

A secondary feeder feature is said to eliminate the need to halt the document processing system to insert control documents. An integrated terminal display and keyboard allows an operator to use menus, keyboard input commands and system messages. The terminal also provides a graphic display of the document tracking system that notifies the operator if an item is not pocketed properly or has been delayed in the sort track, the vendor said.

Available this month, an entry-level DP 1800 system with 200K bytes of memory, four pockets, dual feeders, an MICR reader and mobile carrier tray costs $105,168. A configuration with 712K bytes of memory, 16 pockets, dual feeders, an MICR reader, mobile carrier tray, nonimpact endorser and a microfilm unit costs $320,710.

Burroughs is located at One Burroughs Place, Detroit, Mich. 48232.



Quest for calculator paved IBM's path

THIRD IN A NINE-PART SERIES

By Tom Henkel
CW Staff

Exactly when IBM entered the mainframe computer business is a matter of interpretation. Some said Big Blue's involvement began when it helped fund early electronics research projects at Columbia University in the early 1930s and at Harvard University in the 1940s. Others contend that IBM was not really in the business until the first 701 processor was rolled out in 1952.

But the exact date aside, IBM has done more than just participate in the development of the computer industry. The company's competitive sales tactics, outstanding marketing techniques and hell-bent drive for success have had a profound influence in molding modern computing.

Having established a presence in roughly 70% of the world's mainframe installations, IBM's formidable power appears to have developed into both a blessing and a curse. On the one hand, since no other manufacturer has been able to match the influence wielded by IBM, most new IBM products have traditionally become instantly successful, and strategic IBM moves can become industry standards overnight.

Alternately, by its popularity, IBM has condemned itself to function perpetually under the close scrutiny of the masses. Hundreds make their living by watching IBM's slightest move and by attempting to predict the company's next step. Still others prey on the niche markets that IBM's rumbling bureaucracy passes by. The result has been lost business either from the uncertainty generated by speculators or from the parasitic nature of IBM-compatible vendors.

IBM was researching the potential of then-experimental electronic business machines in the early 1930s when work done by Wallace J. Eckert, a Columbia astronomy professor, caught the eye of Thomas J. Watson Sr., IBM's president. At the time, IBM had already developed the electromechanical

See **IBM** page 100

IBM

from page 99

400 and 600 series calculating machines (the latter was born out of previous Columbia research), but Eckert had an idea he felt would improve their capabilities. Eckert's plan was to enhance the 600 series to permit automatic sequencing that would allow the calculator to perform complex calculations automatically. To accomplish this, Eckert developed a series of specialized devices that allowed an IBM Type 601 multiplying punch card reader to be programmed for automatic operation.

Eckert's research also drew the attention of Howard Aiken, a Harvard physics professor who had also been developing plans to build an automatic calculating machine, which later became known as the Mark 1. IBM was also interested in Aiken's ideas, and in 1939 it agreed to custom-build the Mark 1 for Harvard. The project was completed in 1944.

According to the *Encyclopedia of Computer Science and Technology*, "The Mark 1 was a parallel synchronous calculator that could perform table lookup and the four fundamental arithmetic operations, in any specified sequence, on numbers up to 23 decimal digits in length. It had 60 switch registers for constants, 72 storage counters for intermediate results, a central multiplying [and] dividing unit, functional counters for computing transcendental functions and three interpolators for reading functions punched into perforated paper tape. Numerical input was printed by electric typewriters or punched into cards. Sequencing of operations was accomplished by a perforated tape."

But despite IBM's early experimental ventures into the emerging computer business, it lost the race to be the first company to deliver officially a computer system to a commercial end user. That garland went to rival company Remington Rand Corp., which delivered its first Univac 1 processor to the U.S. Bureau of the Census in 1951.

Remington Rand had pulled off a coup in 1950 when it acquired the Eckert-Mauchly Computer Corp., apparently from under IBM's nose. In his book chronicling the development of J. Presper Eckert and John Mauchly's Eniac system (*From Dits to Bits*, Robotics Press, 1979), Herman Lukoff, who worked on the Eckert-Mauchly development team, said that when Eckert-Mauchly was working to develop the successor to the Eniac, the Univac 1, development costs started to get out of hand. When one of the firm's key financiers was killed in an airplane crash, it became clear the company would have to sell out to a larger firm in order to finish development of the Univac 1. Lukoff said there were rumors at the time that both Remington Rand and IBM were interested in acquiring the company, and Eckert and Mauchly chose Remington Rand because it was a smaller company that they believed offered higher chances for success.

Thomas J. Watson Jr., in an interview with *Computerworld* [CW, June 13, 1983], recalled that "IBM quickly realized from the minute the [Census Bureau] put in the first Univac, our drive was totally commercial. I don't know whether Univac's drive was commercial, but in any case, they got two machines in there.

"I always managed through being terribly afraid of failure. I had been in Washington and had a long talk with the vice-president. I was at the airport and called him back for something and he said, 'And by the way, I forgot to tell you that Remington Rand has two Univacs at the Census Bureau.'

"I was absolutely panicked. We had some machines under development, and we had built the 701, but we had nothing, really nothing, commercial."

IBM photo

The Mark I, IBM's first computer

The shock of Remington Rand's success apparently was the impetus for change within IBM. In the 1983 *Computerworld* interview, the younger Watson said that shortly after the first Univac 1 was installed, IBM significantly increased its research and development expenditures from less than 4% per year to roughly 9% or 10% several years later.

The move worked. By 1964, IBM had readied the 360 line of mainframes, which despite some early problems, revolutionized the computer industry because, as one IBM spokesman noted, it was the first line of computer systems aimed at a general marketplace. Prior to the 360, he added, computer manufacturers were basically tailoring computer systems to fit the user's needs.

The 360 was succeeded in 1970 by the 370 series, which proved immensely successful for IBM but angered 360 users who were forced into making a painful operating system conversion. Some industry watchers contend that those irate 360 users had a profound influence on IBM's large-systems architecture when, seven years later, IBM chose to maintain 370-compatibility by announcing the 3030 series instead of the highly rumored Future Systems (FS).

Jack Hart, an IBM watcher with International Data Corp., a market research firm in Framingham, Mass., contends the FS project was killed because its developers could not develop a reasonable bridge product that would allow 370 users to migrate to the object-oriented FS system.

Since the 3030 line, IBM's mainframe strategy has remained fairly straightforward. Additional models in the 3030 line replaced the high end of the 370 series, and the 4300 line, which was announced in 1979, replaced most of the low end of the 370 line. The 3080 series, which made its debut in 1980, basically replaced the 3030 models, and IBM's newly announced 3090 series processors appear likely to succeed the 3080s.

Sony division adds videotex workstation, printer, modem

By Donna Raimondi
CW Staff

PARK RIDGE, N.J. — Sony Communications Products Co., a division of Sony Corp. of America, has announced several videotex products: the KTX-1350N videotex workstation, the Sony Frame Creator System 1000, the MDM-1200 modem and the UP-103 video/graphics printer.

The KTX-1350N, which uses Microsoft Corp.'s MS-DOS operating system, is said to offer videotex users a method of interfacing with both North American Presentation-Level Protocol Standard (NAPLPS) and Ascii data bases.

The $3,750 desktop system accesses NAPLPS information through its terminal function and processes and stores the information with its computer capabilities, the vendor said.

Features include a built-in NAPLPS decoder, a 13-in. diagonal color monitor, two standard RS-232C communications ports, Centronics Data Computer Corp. and video/graphics printer ports and dual 3½-in. floppy disk drives. The KTX-1350N was designed to operate with Sony's MDM-1200 modem and UP-103 video/graphics printer.

Composite video display

The unit can be used to display composite video signals and can interface with a laser videodisk player, according to the vendor. The Digital Research, Inc. CP/M 86 operation system is available as an option.

The Sony Frame Creator System 1000 is said to create pages of NAPLPS videotex information either by using a camera to input already created artwork or by creating a graphics image from scratch. The basic system costs approximately $35,000 and includes graphics inputting devices, camera stand, printer and red-green-blue color videotex workstation equipped with dual 3½-in. floppy disk drives. The system comes complete with software.

The Frame Creator System 1000 digitizes video sources and encodes into 256- by 210-pixel NAPLPS-standard videotex graphics. Once encoded, the data can become part of a local or telephone-distributed videotex data base, the vendor said. Input sources can be either the self-contained Sony DXC-1821H camera that comes with the system, a color camera such as the Sony DXC-M3 or another video source such as a videocassette recorder or videodisk player.

Composition options include the ability to add text with independent control of character height, width and angle; enlargement of the picture for detailed retouching; creation of windows to permit sections of the image to be treated separately and special effects such as mosaics, according to the vendor.

Sony also announced its MDM-1200 telephone modem and the UP-103 video/graphics printer, both of which were designed to operate in conjunction with Sony's KTX-1350N videotex workstation and the Frame Creator System 1000.

The modem reportedly allows Sony videotex and microcomputer terminals to communicate over standard telephone lines at multiple data speed rates — 110 to 300 bit/sec and 1.2K bit/sec.

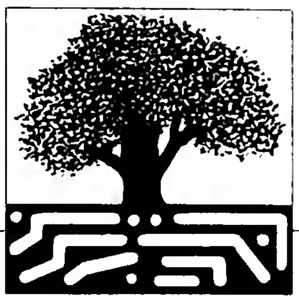
The MDM-1200 is compatible with AT&T 103, 113 and 121A full-duplex asynchronous modems and uses standard RS-232C modem cable. The MDM-1200 features both automatic dialing and answering for unattended workstation operation, the vendor said. The modem costs $529.

Prints from video sources

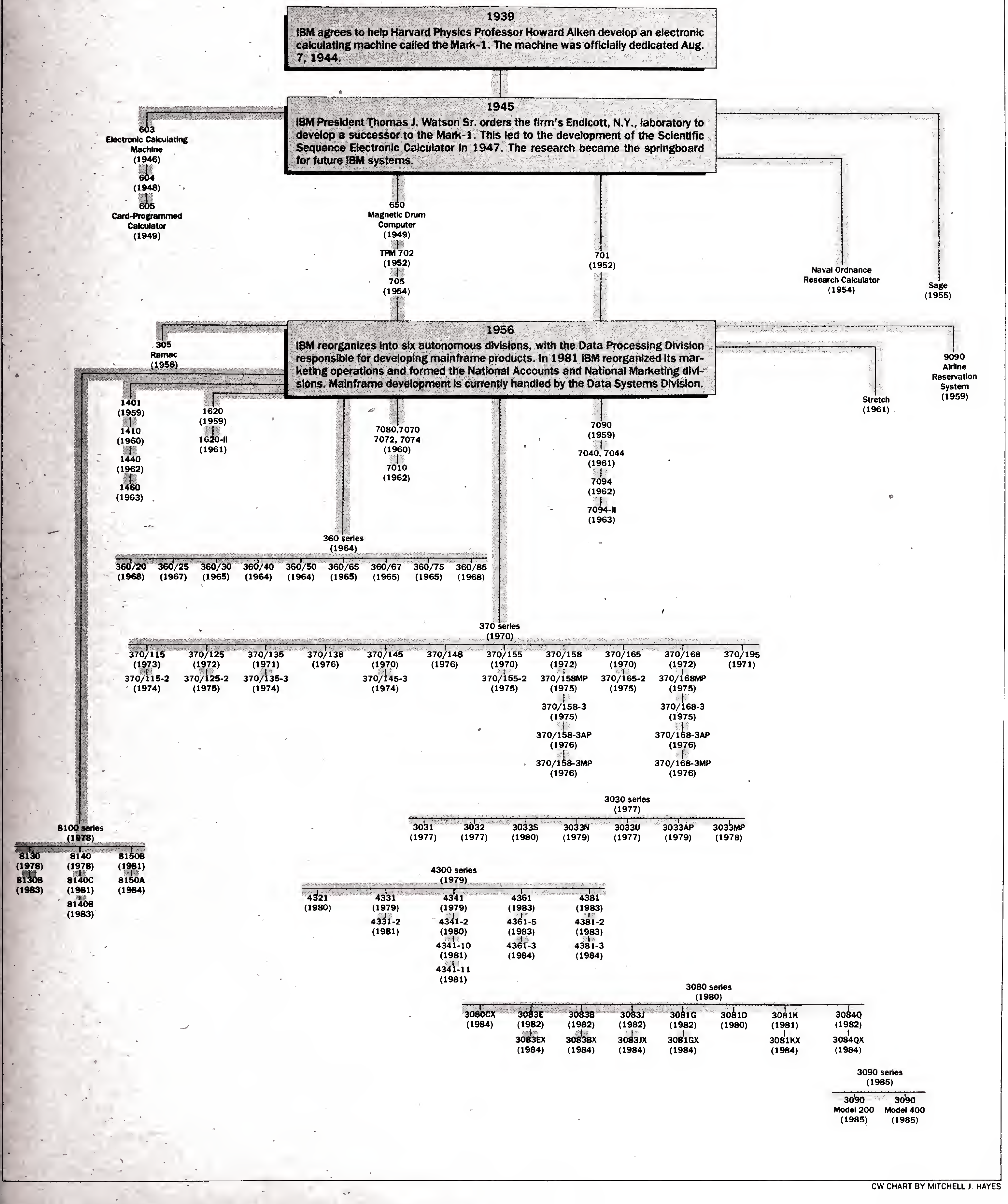
The UP-103 printer is a thermal graphics printer that prints out a screen of text and graphics from any video or videotex source in 9 seconds or less, the vendor said. Videotex sources include NAPLPS or Ascii pages, video cameras, videotape recorder and videodisk players, the vendor said.

The printer provides resolution of 210- by 512-pixels for NAPLPS pages, 250- by 512-pixels for Ascii and 235- by 512-pixels when printing video sources. It prints on 4-in. wide paper and offers a two-times enlargement mode, according to the vendor. It produces either positive or negative images in 16 shades of gray. The printer costs $639.

More information on these products is available from Sony on Sony Drive, Park Ridge, N.J. 07656.



IBM Family Tree



1939

IBM agrees to help Harvard Physics Professor Howard Aiken develop an electronic calculating machine called the Mark-1. The machine was officially dedicated Aug. 7, 1944.

1945

IBM President Thomas J. Watson Sr. orders the firm's Endicott, N.Y., laboratory to develop a successor to the Mark-1. This led to the development of the Scientific Sequence Electronic Calculator in 1947. The research became the springboard for future IBM systems.

1956

IBM reorganizes into six autonomous divisions, with the Data Processing Division responsible for developing mainframe products. In 1981 IBM reorganized its marketing operations and formed the National Accounts and National Marketing divisions. Mainframe development is currently handled by the Data Systems Division.

CW CHART BY MITCHELL J. HAYES

SYSTEMS & PERIPHERALS

PROCESSORS

■ **Uniq Digital Technologies has introduced an enhanced version of its Uniqorn minicomputer, which is based on Digital Equipment Corp.'s PDP-11 series.**

The Uniqorn 11/73 system combines U. S. Design Corp.'s Virtual Information Processor mass storage subsystem, DEC's LSI-11/73 microprocessor and Release 2 of AT&T's Unix System V operating system.

The system features up to 4K bytes of main memory, 128K bytes of fixed disk memory (expandable to 512K bytes), 100M bytes of tape storage and a cabinet.

The basic Uniqorn system price is $24,995.

Uniq Digital Technologies, 28 S. Water St., Batavia, Ill. 60510.

■ **Telesis Systems Corp. has introduced its EDA-600 coprocessor, a 32-bit plug-in hardware option for its computer-aided design workstations.**

The coprocessor, based on National Semiconductor Corp.'s 32032 microprocessor, runs under AT&T's Unix System V operating system. It executes at speeds of up to one million instruction/sec., according to the vendor.

The EDA-600 consists of a CPU and a 2M-byte memory board connected over a bus.

The coprocessor plugs into the backplane of any existing Telesis CAD workstation or remote processing unit, according to Telesis Systems.

The EDA-600 is priced at $19,000.

Telesis Systems, Two Omni Way, Chelmsford, Mass. 01824.

DATA STORAGE

■ **Xylogics, Inc. has announced enhancements to its 450 and 451 Multibus storage module drive (SMD) disk controllers that are said to allow a disk manufacturer's media defect map to be read directly from disks that contain standard format defect information. This is said to eliminate special power connections and allows users to integrate enhanced 9-in. SMD disk drives.**

The Xylogics 450 and 451 are said to enable a programmer to read the defect list from the disk prior to formatting. This information can then be used to create bad-block tables. Manufacturers currently supporting the standard format for disk defect information include Ampex Corp.; Control Data Corp.; Fujitsu America, Inc.; Mitsubishi Electronics America, Inc.; NEC Information Systems, Inc.; and Pertec Computer Corp.

The company has added a 5V, dc, on-board regulator to the 450 and 451 to eliminate special power connections. Xylogics has also added its own custom very large-scale integration parts, which are said to provide the flexibility to integrate the 9-in. enhanced SMD disk drives.

The 450 costs $2,295, and the 451 costs $2,495.

Xylogics, 144 Middlesex Tnpk., Burlington, Mass. 01803.

GRAPHICS SYSTEMS

■ **MNC International has introduced its IBM Personal Computer-compatible Mcad family of workstations for computer-aided design.**

The Mcad 1000 has a 10M-byte disk drive and 256K bytes of random-access memory (RAM), an amber monochrome graphics adapter and Autodesk, Inc.'s Autocad 2 software. The unit costs $4,850.

The Mcad 2000 is the same as the Mcad 1000 but uses two monitors — a monochrome display as a systems console and a graphics design medium-resolution color display. The Mcad 2000 costs $6,995.

The Mcad 3000 is a two-monitor combination that uses a 1,024- by 768-pixel resolution combined with 16 simultaneous colors. Disk memory is 22M bytes, half of which is available on a removable cartridge. The basic model also includes 512K bytes of RAM. This unit costs $11,995.

MNC International, MNC Building, 2817 Anthony Lane S., Minneapolis, Minn. 55418.

■ **Evans & Sutherland Computer Corp. has unwrapped its PS 350 three-dimensional computer graphics system, an addition to its PS 300 family that runs under a proprietary operating system.**

The PS 350 includes a refresh buffer that allows for the separation of display update and display refresh. In highly structured design environments, this component is said to yield greater display capacity. A designer reportedly can view a complete airline design and zoom in on a specific rivet without loss of image quality or degradation of data resolutions.

The PS 350 provides up to 127 line textures to help clarify the model, in addition to the 3-D visual queues of perspective, depth-queuing and smooth display dynamics.

The basic system — with 1M byte of memory — starts at $49,250 for a monochrome version and $57,050 for a color system. Both are upgradable to 4M bytes of main memory.

Evans & Sutherland, P.O. Box 8700, 580 Arapeen Drive, Salt Lake City, Utah 84108.

■ **Color graphics, on-line help, dual synchronized displays and testing capabilities have been added to Calma Co.'s turnkey Tegastation 3.0 computer-aided engineering workstation, based on Apollo Computer, Inc.'s DN300 processor. In addition, the firm said it cut the base price of the DN300-based model of the Tegastation 3.0 by $9,000.**

A spokesman said larger model li-

Continued on page 106

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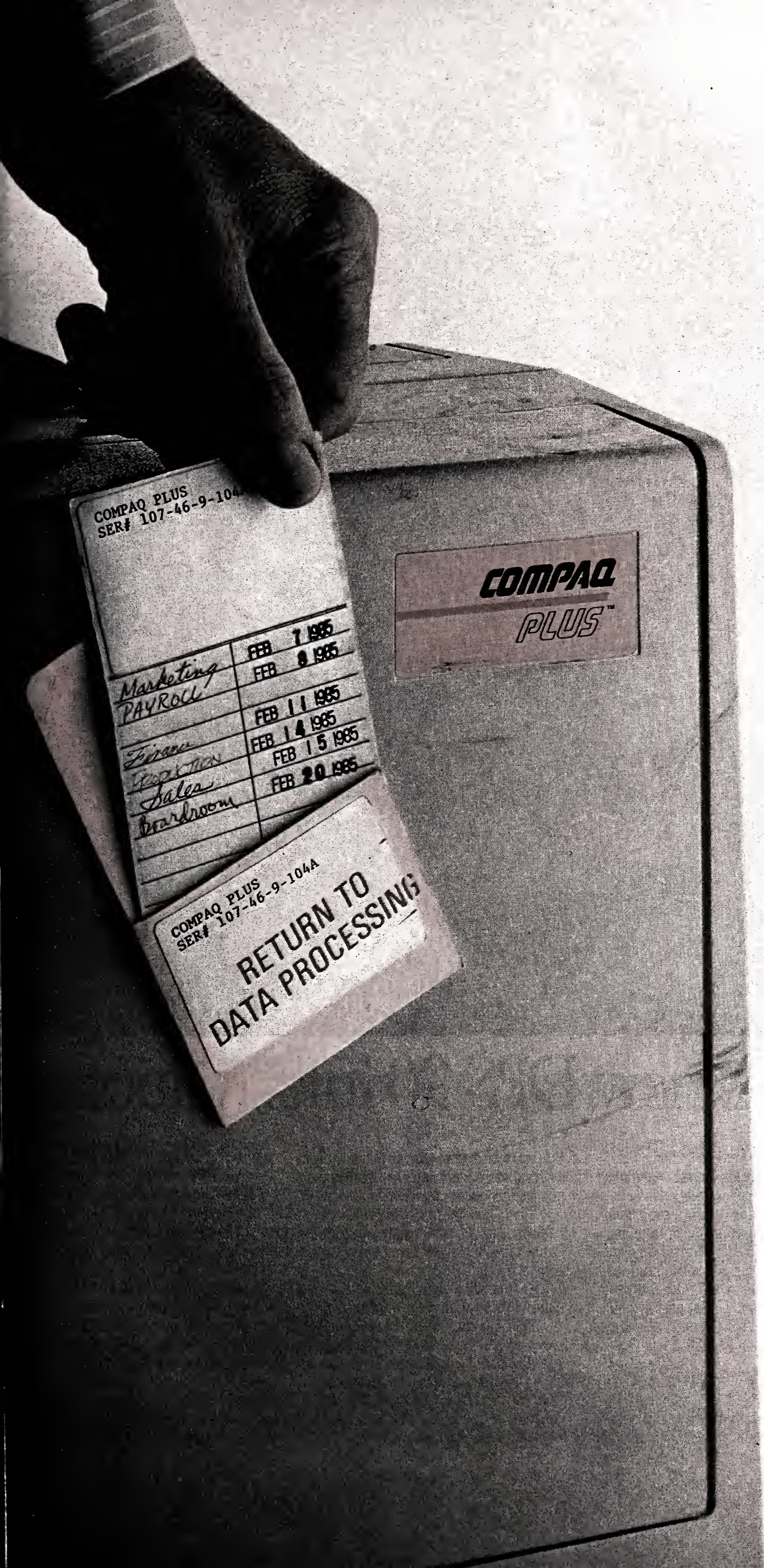

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Continued from page 102

braries give designers access to more than 1,200 system-level simulation models for circuit board design. A T-scope color waveform analysis package incorporates two screens.

Computer-aided engineering and testing tools include schematic capture, logic and verification simulation, simulation net lists, Taskmaster applications supervisor and file managers and T-cat, a computer-aided test system for automatic test pattern generation, the vendor said.

The DN300-based Tegastation 3.0 costs from $38,000 to $44,000. Other models of the Tegastation 3.0, based on Apollo DN460 and DN660 workstations, cost from $74,500 to $108,000, depending on configuration.

Calma, 501 Sycamore Drive, Milpitas, Calif. 95035.

POWER SUPPLIES

■ **International Power Machines has announced expansion of its Endless Power transistorized uninterruptible power supply (UPS) family.**

The Endless Power UPS is now available in 100-kVA, 133-kVA and 167-kVA versions. The UPS conditions raw utility electrical power for computer use while protecting against sags, blackouts, surges, spikes and oscillatory voltages. Prices range from $69,000 to $84,000 for the 100-kVA unit, $74,000 to $90,000 for the 133-kVA unit and $76,000 to $92,000 for the 167-kVA unit.

International Power Machines, 11534 Pagemill Road, Dallas, Texas 75243.

■ **Topaz, Inc. has announced its Line 2 zero-current tap-switching power conditioners that protect minicomputers and other electronic equipment from electrical noise and voltage fluctuations.**

The conditioners feature Topaz' Powerlogic microprocessor for voltage regulation. Power fluctuations are said to be corrected in less than one cycle of line frequency. The Line 2 power conditioners offer common-mode noise attenuation of 140 db (10 million to 1) and normal-mode noise attenuation of 60 db (1,000 to 1). The conditioners are available in 50Hz and 60Hz models, with power ratings from 10 kVA to 30 kVA.

Prices of the 50Hz model range upward from $545; and prices of the 60Hz model range upward from $410.

Topaz, 3855 Ruffin Road, San Diego, Calif. 92123.

PRIME from page 99

management decided to go for the 9955.

By May 1, the company will be using two 9955s, he said. The firm will upgrade its existing 750 to a 9955 as soon as its first 9955 is ready.

The original decision to go with Prime was based entirely on software requirements, he said. Comstock had chosen construction software from Profitool of Denver, which ran on Prime equipment. IBM had inadequate construction software that ran only on the System/36, which was too small for Comstock's needs, he said, adding that there was no satisfactory software for the System/38.

Comstock had a significant amount of software written in RPG-II, so Prime helped the company find a software vendor — Data Base Systems Corp. of Phoenix — to recompile the IBM RPG-II for Prime machines, according to Cynthia McFarland. Data Base Systems' Escape/34 recompiling package was originally written for conversion from IBM System/34 to Prime but also worked for the conversion from IBM System/3 to Prime, she said.

To transfer pertinent payroll information like master files or a file listing every check withdrawn, Cynthia McFarland said, a tape transfer from the IBM to the Prime 750 worked out well. Other items, like a labor distribution package that included more than 250 programs, had to be recompiled. The 9955 did this without problems.

MANAGE from page 99

ities quickly. Unlike traditional software functions that focus on the storage and processing of large amounts of information, managers need a system that focuses on the retrieval of specific pertinent information. They want to reduce the number of logical decisions they must make to obtain information that is useful.

A manager's work is time-intensive. They do not have blocks of time to invest in learning to use new computer systems. That is why graphics is an important element. Graphics communicate relationships that give contextual information that can be absorbed quickly.

Critical success factors are elements that managers identify as being the most important for achieving their business objectives.

Having identified the critical success factors, the information system must be realigned to support management activities. This process involves examining the information that is now available to managers and testing each piece for its relevance to these critical success factors.

In some cases, the information may need some transformation, such as expressing it as a ratio to some other number or as a trend in its historical context. Graphics representations of information allow for easier tracking and reviewing of critical success factors.

Graphics has become an effective managerial tool to compress, track and control information.

As managers continue to emphasize planning and control, information systems that alert managers to trends and events will give managers more of a competitive edge.

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COMPUTER INDUSTRY

Industry slowdown seen short lived

But current impact on firms widespread

By Clinton Wilder
CW Staff

The computer industry sales slump that has marked early 1985 is concentrated in the mini- and microcomputer markets and is only short term, according to several vendors and analysts.

"Our customers spend the first quarter kind of catching their breath," said one branch manager of IBM, which last month predicted its first declining growth quarter since 1981. "My gut feeling is that it's just a first-quarter downturn."

Analysts tracking IBM pointed to the "product cycle theory," attributing the current Big Blue downturn to a wait-and-see customer reaction to the recent unveiling of the 3090 Model 400 (Sierra). "IBM is a cyclical growth company, operating in distinctive cycles that follow the product lines," said Harry Edelson of Edelson Technology Partners in Saddlebrook, N.J. "When they announce a major new product, they have a downturn. It happened in 1964, and it happened in 1970, so this is no surprise."

But IBM is not immune to the current drop in office automation orders that has halted the fast-paced growth of OA leader Wang Laboratories, Inc., analysts said. "Everyone thought this would be a year when large-scale OA would catch on," said David Moschella of Framingham, Mass.-based International Data Corp. "But there's still a lot of evaluation going on. People are looking at the Wang VS65 or the IBM System/36 and trying to make a decision."

Cautious customers also appear in the traditional markets of Digital Equipment Corp. and Data General Corp., whose pessimistic first-quarter forecasts preceded IBM's. "Sales interest seems to be continuing at a high rate, but people are looking very hard before spending their money," said DG spokesman Ken Donahue. "It's a very curious thing. Orders are traditionally flat early in the year, but this has continued into mid-February. There seems to be a pause, a feeling of 'Let's take a rest and see what happens.' "

DEC spokesman Mark Steinkrauss said DEC has felt the current downturn the hardest in its midrange to low-end products — the PDP-11 mini series and the lower end models in the VAX-11 series. The most sluggish traditional DEC markets, he said, have been industries using

See **SLOW** page 117

CDC cites Ohio bank crisis as one reason for layoffs

MINNEAPOLIS — Control Data Corp. said last week it has not yet set a target for work force reductions that will be implemented to cut operating costs in the face of a sales slump and potential losses associated with the Ohio thrift bank crisis.

In a letter to employees dated March 28, CDC President Robert M. Price said the company will cut its 54,000-person work force and sell off nonstrategic assets in an attempt to improve profitability. Price said he no longer expects CDC to meet his earlier profit projection of $4 per share this year, but the company declined to issue a revised projection.

Price informed employees of planned work force adjustments and said he hopes to manage the reduction without across-the-board layoffs. The company has halted most external hiring and hopes to cut costs through attrition, reassignments and retraining. "If these gradual processes fail, there will be some terminations," a CDC spokesman said.

The spokesman also said no target figure has been set for the

See **CDC** page 117

Intel execs predict slowing of semiconductor sales slump

By Kathleen Burton
CW West Coast Bureau

SANTA CLARA, Calif. — Intel Corp. executive told shareholders recently that the semiconductor industry should shake off its current sales slump in coming months, but price declines will continue to slow revenue growth.

Intel Chairman Gordon Moore told shareholders at the company's annual meeting that semiconductor manufacturers are still "caught in the greatest industry collapse since 1974's oil crisis."

According to Moore, the semiconductor industry worldwide will show no revenue growth in 1985 over 1984. He said the industry will continue "bumping along the bottom" before traditional growth rates resume during the second or third quarter of this year. But, he added, even when orders pick up, price declines will continue to slow revenue growth from the rapid pace of 1983 and early 1984.

See **SLUMP** page 118

- The micro Winchester disk drive industry is suffering 'a severe case of indigestion,' but more reasonable growth rates will enable the top eight vendors to survive a shakeout, according to a recent report/**110**
- Trilogy recently linked up with GM's Electronic Data Systems in an attempt to generate revenue from facilities that were idled by Trilogy's failure to execute its original business plans/**111**
- The sales slump apparently has spread to telecommunications equipment, with Intecom reporting the layoff of 200 employees/**114**

Despite PCjr flop, IBM still has momentum on its side

INDUSTRY INSIGHT
Peter Bartolik
CW Senior Editor

Following the sudden expiration of the IBM PCjr, the view in this corner sides with those who predicted that IBM's withdrawal from the consumer electronics market is just a short-term strategic retreat.

Although there is much temptation to rejoice at the image of mighty Big Blue humbly stepping back from one of the very few mistakes in its history, such an attitude would ignore what they aptly label on *Monday Night Football* as the Big Mo.

At this point in time, IBM undeniably has momentum on its side. It has a lock on the corporate mainframe environment, calls the shots in the workstation industry and is eagerly eyeing the markets traditionally dominated by the likes of Digital Equipment Corp. and Wang Laboratories, Inc.

Not lazy

Unlike the U.S. economic gargantuans of the past, IBM has not noticeably stagnated and grown lazy. It is pouring an enormous amount of wealth into research and development to protect and increase its share of the information processing industry. It is avidly staking out near-term growth markets such as automated manufacturing and seems poised to pounce if U.S. academia again becomes the focus of technological leadership, as history said it must.

To continue toward its obvious goal of being the biggest and most profitable world corporation in the next decade, IBM must become all things to all people as society begins to drape itself in the creature comforts of microtechnology.

Those who see IBM abandoning the consumer market perhaps have forgotten about Trintex. That partnership, formed with CBS, Inc. and Sears, Roebuck & Co., is quietly embarking on developing commercial videotex services. IBM is also the majority partner in Satellite Business Systems (SBS), which someday will surely hold a leading role in the satellite delivery of consumer communications and services.

Credit card of the future

A subsidiary, IBM Credit Corp., already issues credit cards for the purchase of IBM micros. Sears has made recent moves to turn its in-store credit card into a Mastercard type of instrument. Who is to say that IBM doesn't envision the day when red-blooded Americans key in their IBM credit number into an IBM keyboard linked to a Trintex line or Rolm PCX (private consumer exchange) for transmission by SBS to IBM mainframes that route purchase orders via a Systems Network Architecture network to who knows what future partnerships.

If at some point the dreams of science fiction writers are realized and the factory and office commerce is essentially automated, somebody is going to have to fill the leisure time of idle workers. And who would be better qualified than the company that created so much leisure time and finds itself faced with creating new markets or dying of self-induced obsolescence?

All this may seem a little farfetched, but who can remember the time when IBM actually gave up a project? History shows that, when thwarted in one plan, IBM simply adopts Plan B, or Plan C or . . .

User bugged by distribution of defective packages

OUTSIDE LINES
L. J. Kutten

According to a study commissioned by the Association of Data Processing Service Organizations (Adapso), more than 50% of microcomputer software packages in use are unauthorized copies. I do not doubt the validity of the study; Adapso is a fair and honest organization whose goal is to protect the good name of the industry. So I am sure that for Adapso's next project, it will seriously consider going after another type of pirate: the software companies that knowingly distribute defective (bug-ridden) software.

I am not complaining about the random, obscure bug (I know how hard it is to create bug-free software) but rather the bugs that come out and defeat the software program's entire purpose; the bugs that are so bad that any half-awake person could have and should have discovered them before the program went out the door. Take the following five examples:

■ First there was the telecommunications program that could not communicate. In 1979, I bought a program to retrieve data from Compuserve Corp. and the Dow Jones & Co. network. It came with instruction manuals and passwords for both networks. Unfortunately, it could not communicate with Dow Jones. For more than a year, the company denied in writing there was a problem. I was told the problem was with my hardware. Finally I contacted the actual programmer. He told me he knew of the problem and how to solve it. I made his patches and the program worked. Of course, in the meantime, I had bought another program to communicate with Dow Jones.

■ In 1980, I bought a checkbook maintenance program. Its bug was that it rejected 1% of the numerical entries as being invalid numbers. For three months the company denied there was a problem. Only after I sent it a disk containing the actual program did the company admit a bug existed. Their excuse — they had accidentally distributed a number of beta versions to paying customers.

■ Then there was the word processing program that was advertised and sold as being able to work with documents up to 170K. Its problem was that it worked fine with small files, 15K to 20K, but with anything above that it crashed and destroyed the document file.

■ Next there is a spelling checker that was advertised as working with a word processor whose file size is limited only by the size of the diskette. However, the speller can only handle a maximum file size of 32K, a point that I discovered by trial and error. It is not mentioned in the documentation. To add insult to injury, this program has a unique form of error trapping; after it discovers the error it puts itself into a continuous loop. The only way to get out of it is to restart the computer.

■ But my favorite bug is the most recent. I was given a data base program to review for the Apple Computer, Inc. Macintosh. I received both a demonstration diskette and a working diskette. After working with both, I decided to copy the data files from the demo to the working diskette in order to manipulate them. Unfortunately, the data files on the demo were too big for the real program. I wonder how the company got the demo to work?

And what happens if I complain to the company? Regardless of its size or reputation, I was always given the same two replies: "All programs are sold as is," and "Buy the upgrade."

'What protection?'

This got me thinking — "What protection do I get from the software industry?" As far as I can tell the only thing any software developer promises is that the physical diskette is not defective. If it is bad, it will be replaced. Could it be that the software industry has finally achieved the American businessman's dream of being able to take the consumer's money and then walk away, free of all liability?

Now I learn a considerable segment of the industry wants to develop hardware locks on the software. If the master diskette dies or the key breaks, the user is to contact the developer who will gladly sell him — for a price — another master copy or key. This assumes these companies will be around in the foreseeable future. But what happens if they are not? I wonder, what is the average life of a software company?

Somehow this cry of woe is not very convincing to software consumers like myself who depend daily on those programs for Apple, IBM or [Tandy Corp.] computers developed by companies that are now just part of fond memories and history.

Kutten is a writer specializing in computer law topics. He is a member of the Illinois and Missouri bars. His book, Computer Buyer's Protection Guide, *was published last year by Prentice-Hall, Inc.*

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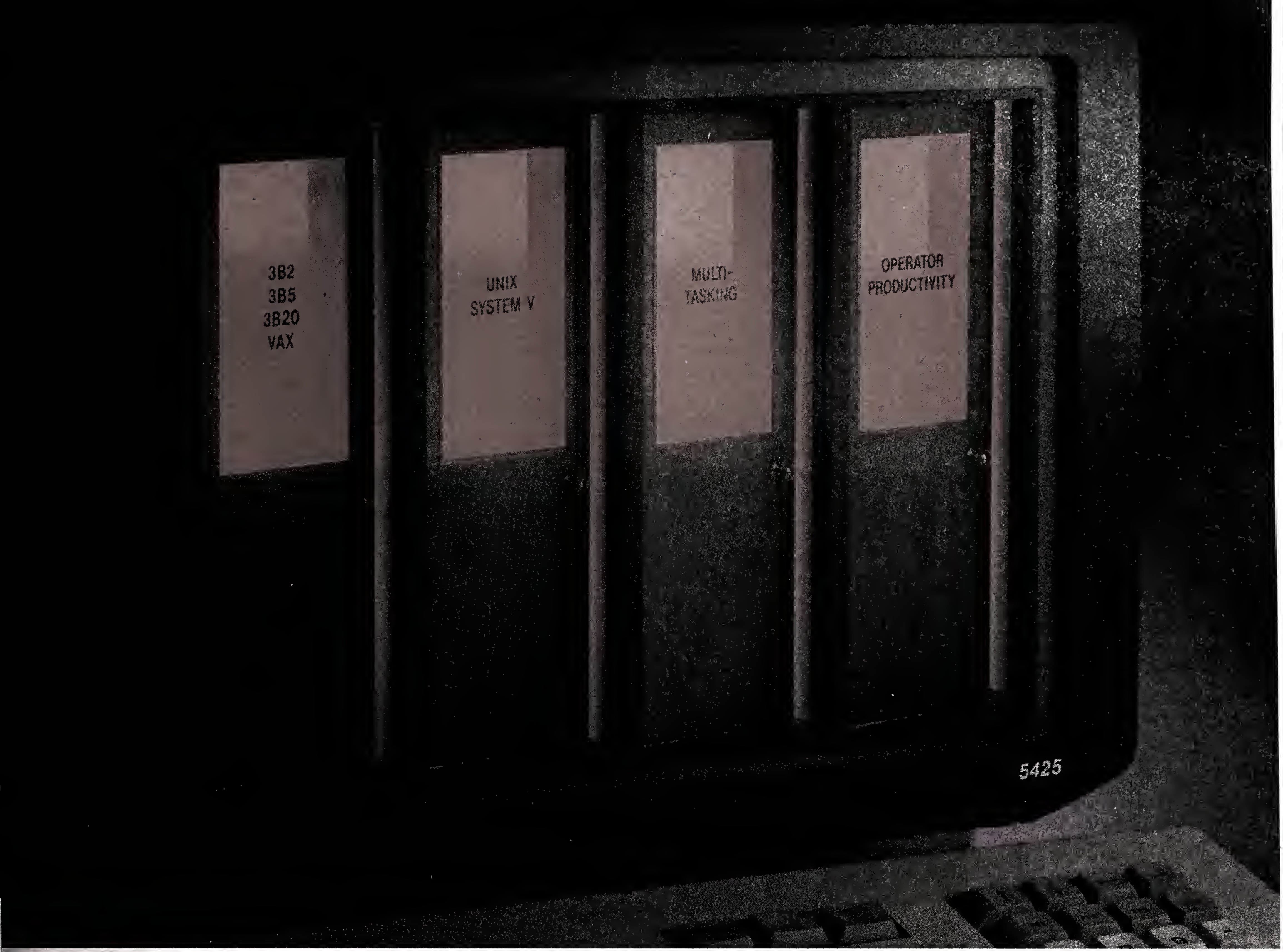

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With 38 downloadable function keys and 16 screen labels, the 5425, which is also VT102* compatible, opens new levels for productivity. And the optional integrated intelligent modem features five programmable autodial keys to speed the dialing and logon functions. The modem also permits remote transmission from a standard phone jack.

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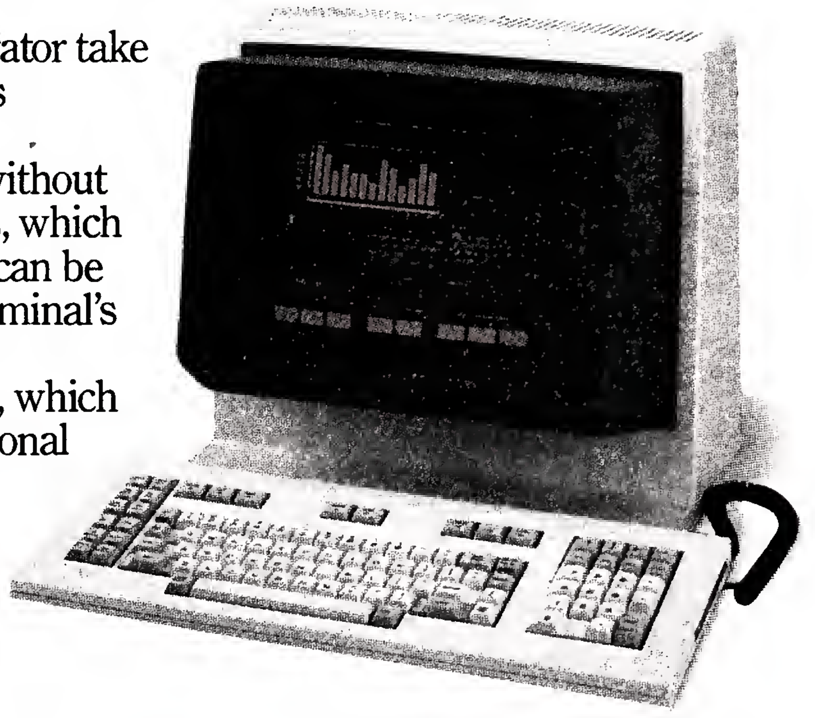

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Report: Hard disk drive industry 'alive but suffering'

NEW YORK — The industry for small-size Winchester disk drives "is alive but is suffering [from] a severe case of indigestion caused by overcapacity, overordering and overinventory," according to a two-part industry review released recently by Shearson Lehman/American Express, Inc.

Despite the current problems, the investment firm predicted that a 30% growth rate in 1985 and a 20% to 25% growth in 1986 will enable the top eight vendors to endure a shakeout and return to high revenue levels.

Noting that the top eight firms control 80% of the market for the 5¼-in. and smaller Winchester disk drive products, Shearson Lehman predicted "that the eventual shakeout will occur mostly among the small, private companies."

The investment firm said the market for the drives grew at an 80% rate in 1984 to $1.2 billion on shipments of 2.4 million units. By 1987, the firm projected, industry revenue will double to $2.4 billion, but shipments will treble to seven million.

The most uncertain factor facing the industry is IBM, which currently buys 30% to 40% of all output, the report said. However, Shearson Lehman said it is likely that IBM will, in a worst-case scenario, manufacture only one-third of its requirements and probably will manufacture only 20% to 25% of all drives used in IBM equipment. Citing IBM's recent willingness to buy components, particularly for its Personal Computer, and that smaller firms with lower overhead can probably deliver lower cost drives, the report predicted that IBM will focus on manufacturing disk drives that require "unusual technology."

'IBM may overorder'

IBM, according to the report, will probably require as many disk drives from other vendors in 1985 as it purchased in 1984. However, the report cautioned, "In order to assure sufficient drives, IBM may overorder and subsequently cut back the lower performing vendors."

Evaluation of the disk drive industry is difficult because it is only four years old and marked by rapid technological changes and the injection into the market of new products, the report said. "Most vendors are completely revamping their lines, and by early 1986, more than 80% of the micro Winchester revenue will be from new products," the report stated.

The report, "Winchester Disk Drives: Rotating Into a New Cycle," was prepared by the research division of Shearson Lehman/American Express, 101st Floor, Two World Trade Center, New York, N.Y. 10048.

Burroughs signs order

WASHINGTON, D.C. — The Securities and Exchange Commission (SEC) recently charged Burroughs Corp. with overstating its earnings in 1981 by not writing off obsolete equipment in a timely manner. The company signed a consent order agreeing to reduce 1981 earnings and to increase by an identical amount earnings reported in 1982 when the company wrote off inventory by $154 million.

The settlement came as part of an administrative action by the SEC; Burroughs neither admitted nor denied the charges.

The settlement resulted in Burroughs' pretax income increasing by $35.2 million in 1982, and decreasing by an identical amount in 1981. The actual changes spread over two fiscal years amounted to the shifting of more than $60 million in income.

Burroughs said it chose to settle the matter because stockholders would be ill served by incurring litigation expenses and a diversion of management resources.

Trilogy reports losses; EDS to run computer facility

CUPERTINO, Calif. — Trilogy Ltd. recently announced it had contracted with Electronic Data Systems Corp. (EDS) for the operation, management and marketing of Trilogy's computer facility here.

The company also released its 1984 financial report, posting an $82 million loss on revenue of $11.8 million.

EDS, the Dallas-based computer services company that was acquired last year by General Motors Corp., will integrate Trilogy's data center into the EDS nationwide network, spokesmen said.

Trilogy built its data center and various production facilities to develop and produce wafer-scale integrated circuits and an IBM plug-compatible mainframe that would have used those wafers. However, both projects were canceled.

Henry C. Montgomery, president and chief executive officer of Trilogy, said the agreement with EDS reflects Trilogy's "business strategy to find revenue-producing uses for our facilities."

The agreement calls for EDS to leverage engineering and scientific applications software developed by Trilogy.

Trilogy's 1984 loss of $82 million, or $2.19 per share, compares with a loss of $21.7 million, or $1.22 per share, in 1983 on revenue of $44.8 million.

In the fourth quarter, the company posted a loss of $2.9 million, or 8 cents per share, on revenue of $1.6 million; in the year-earlier quarter, the company posted a loss of $15.3 million, or 63 cents per share, on revenue of $13.8 million.

All of the revenue in the fourth quarter and a total of $2.2 million during the year, were derived from development services provided to Sperry Corp. under a contract that Trilogy previously announced was to be terminated last month.

Included in the loss for the year was a previously announced reserve of $43 million recorded in the second quarter relating to the cancellation of the mainframe project. Trilogy said it charged against that reserve expenses related to the discontinued activities amounting to $2.7 million in the fourth quarter.

Pansophic reports rise in revenue

OAK BROOK, Ill. — Pansophic Systems, Inc. recently reported revenue increases for the third quarter ended Jan. 31.

The software vendor said third-quarter revenue rose to $20.1 million, compared with $16.1 million in the previous year — a 24% increase.

The company cited strong growth in product and license revenue from the introduction of three software products in 1984. Product and license fees increased 56% in the third quarter, the company said.

Profits for the third quarter rose 29% to $4.4 million, or 52 cents per share, compared with 40 cents per share in the same quarter last year.

Operating costs up

The Nov. 1 acquisition of Telon software from Christensen Systems, Inc. contributed to slightly higher operating costs during the quarter, Pansophic said.

Income from operations was 26% of revenue during the quarter, compared with 30% of revenue in 1984.

Joseph A. Piscopo, Pansophic's chairman and chief executive officer, said he expects the firm's improved domestic sales to continue in 1985. Piscopo said Telon software and other new products have met with favorable market acceptance, and the Pansophic sales force has shown improved productivity.

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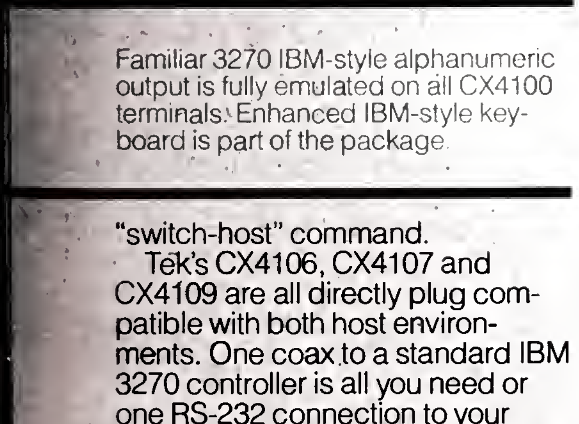

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IBM flexibility is matched by DEC flexibility. In RS-232 mode, the terminals can run all VT100 applications through the extended ANSI X3.64 command set. In addition to the host interface port that transmits data at rates up to 38.4k baud, CX terminals are provided with two additional RS-232 ports and a Centronics-style parallel port for connecting a wide range of peripherals.

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Bell subsidiary to market Centrex nationwide

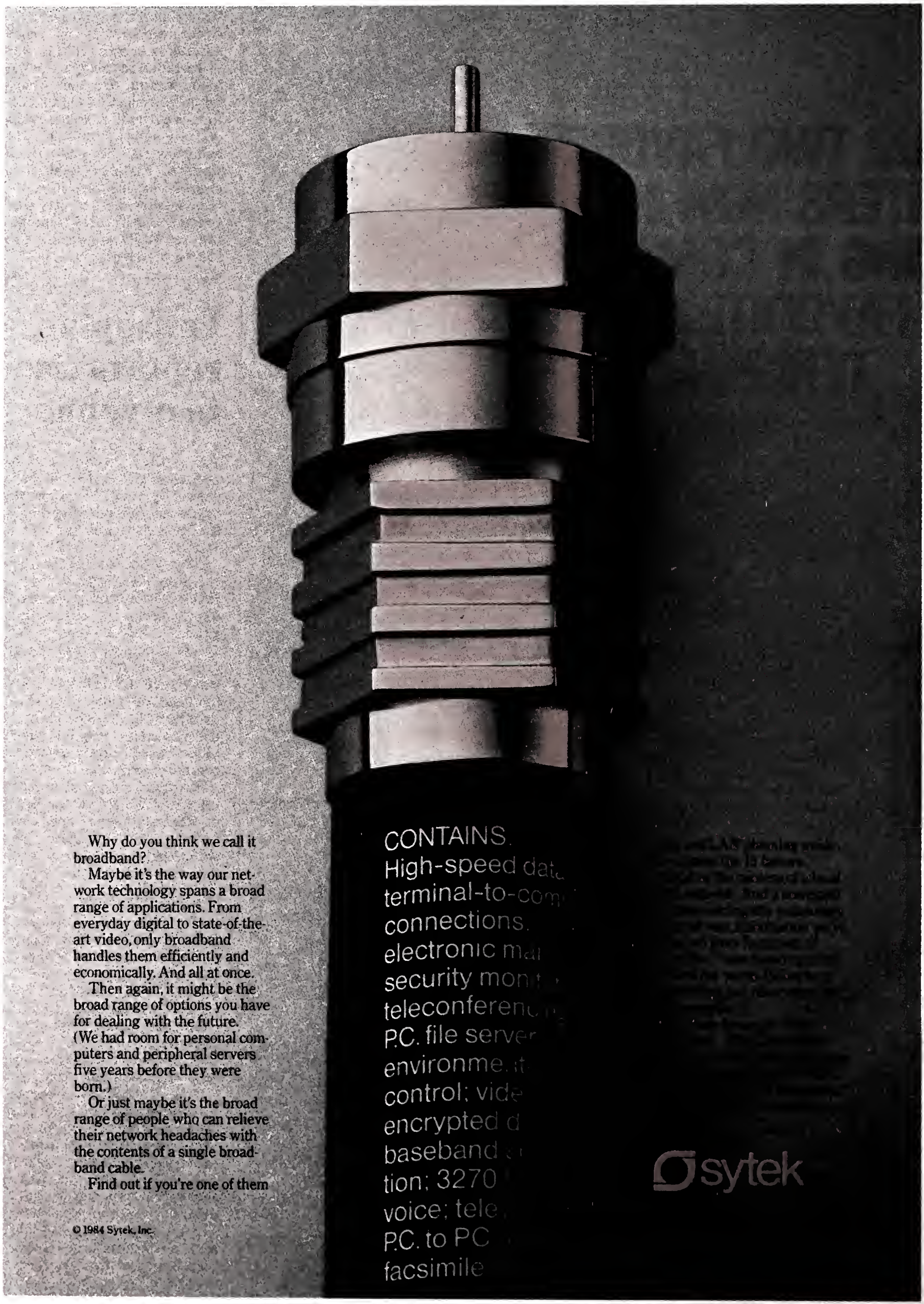
SUNNYVALE, Calif. — Ameritech Communications, Inc., the marketing subsidiary of the Bell system's midwest regional holding company, has announced an agreement to distribute nationwide a Centrex voice and data enhancement product that is manufactured by David Systems, Inc., located here.

Ameritech Communications will distribute the David Information Manager through the Ameritech Bell companies' unregulated equipment subsidiaries and through a national sales force. The agreement took effect March 15; terms were not disclosed.

The voice and data enhancement product reportedly provides Centrex service with asynchronous terminal communications, high-speed local-area networking and enhanced telephone features.

Daniel Latham, Ameritech Communications vice-president of marketing, said the David Information Manager will strengthen the company's product offerings and give existing Ameritech Communications customers added service capability.

Ameritech Communications is the national marketing subsidiary of Ameritech, the Chicago-based parent of the Bell companies providing telephone service in Illinois, Indiana, Michigan, Ohio and Wisconsin.



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Onyx + IMI, Corvus set merger plan

SAN JOSE, Calif. — Corvus Systems, Inc. and Onyx + IMI, Inc., both headquartered here, recently announced they had reached an agreement in principle for a merger of the two companies.

Corvus is a manufacturer of mass storage products and the Omninet local area-network. Onyx + IMI is the parent company of Onyx Systems, Inc. and a manufacturer of 8-bit and 16-bit microcomputers including multiuser workstations using AT&T's Unix operating system.

Under the terms of the preliminary agreement, stockholders of Onyx + IMI will receive between 1½ and 1⅓ shares of Corvus stock for each of their current shares. The merged company will be named Corvus Systems, Inc.

The management of the merged company will comprise Michael L. D'Addio, current Corvus chairman and chief executive officer serving in the same positions in the new entity; Onyx + IMI President Herbert J. Martin serving as vice-president of marketing and sales; and Roy A. Wright, current Corvus executive vice-president and chief operating officer, retaining those titles.

"This merger is a good business fit," D'Addio declared in a prepared statement. "Our complementary management strengths, strong combined financial resources and increased operating efficiencies will give us the muscle and expertise to compete more aggressively in the computer, communications and peripherals markets."

The board of directors of the merged company will comprise the four current members of the Corvus board and three of the four current members of the Onyx + IMI board.

The companies said the agreement is subject to final approval of a definitive agreement and the receipt of opinions from investment banking firms as to the fairness of the transaction to the shareholders of each company.

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For more information, contact Ed Marecki, National Sales Director, *Computerworld Focus,* 375 Cochituate Rd., Framingham, MA 01701. Or call (617) 879-0700.

*A minimum size of 7" x 10" (500 lines) is required for ads to be eligible for a Starch study.

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CAI reorganizes operations

JERICHO, N.Y. — Computer Associates International, Inc. (CAI) recently announced that it has divided its sales and support operations into four divisions for the fiscal year beginning April 1.

The mainframe and micro software vendor has set up a systems products division, applications products division, international products division and Sorcim/IUS micro software division. Each division has its own sales, development/support and marketing departments.

CAI President Charles B. Wang, said the changes were prompted by greater specialization within the company. "Bringing together these groups under a single umbrella should increase the cooperation, coordination and efficiencies that we seek always to improve," Wang said.

Wang announced the appointment of the following four executives to serve as divisional presidents: David J. Wardle, systems products; Arnold S. Mazur, applications products; Stefan R. Bothe, international products; and John J. Callanan, Sorcim/IUS micro software. He also named Abraham Poznanski as president of corporate services and Russell Artzt as president of corporate R&D.

The firm has reportedly installed more than 40,000 mainframe software products and more than 600,000 Sorcim/IUS microcomputer products.

Fourth-quarter downturn ends year of divestiture at ITT

NEW YORK — ITT, in the midst of an aggressive divestiture program, recently reported a sharp drop in profits for the fourth quarter and for fiscal year 1984.

The company announced that profits for the year dipped 34% to $448 million, or $2.97 per share, compared with $675 million, or $4.50 per share, in 1983. Total revenue increased to $19.6 billion in 1984, up 5.2% from 1983. Excluding the company's insurance and finance operations, revenue increased to $12.7 billion from $12.5 billion in 1983.

In the fourth quarter, ITT reported profits of $175 million, or $1.16 per share, down 37% from profits of $278 million, or $1.86 per share, in the year-earlier period. Excluding finance and insurance activities, revenue was $3.7 billion, up from $3.6 billion a year earlier.

Net income for the fourth quarter and the fiscal year fell $76 million, reflecting the sale of ITT's telecommunications manufacturing facilities in Argentina. Profits increased by $124 million from the sale of a food products subsidiary and by $55 million from recognition of a gain in the value of ITT's investment in Standard Telephone and Cables PLC of the UK.

Intecom reduces work force, cuts overhead outlay

ALLEN, Texas — Intecom, Inc. recently announced the layoff of 200 workers, mainly in manufacturing positions, and reduced overhead spending in all company departments.

The layoffs reduced the number of Intecom employees to 1,450. The company said field service, engineering and sales personnel were not affected.

The telephone equipment switching manufacturer blamed its lower revenue projections on customers' concerns about the U.S. Department of the Treasury's tax reform proposals and consideration of new distribution channels created by the AT&T divestiture.

C. Michael Bowen, Intecom's chairman and chief executive officer, cited "general economic circumstances that are affecting most major corporations in the computer and telecommunications [industries]."

Intecom reported profits of $11.7 million on revenue of $131.7 million in 1984.

Sperry obtains Mnemos stock

WEST TRENTON, N.J. — Sperry Corp. recently exercised an option to purchase five million shares in Mnemos Ltd. and obtain license rights for Mnemos's technology for a total price of $5 million.

Part of that price was credited against a five-year limited license previously granted to Sperry.

Mnemos, which is headquartered in Bermuda, operates sales and manufacturing subsidiaries here and in the UK that specialize in serving data base management requirements by combining optical and digital products and systems.

Sperry also was granted the right to acquire an additional five million shares in Mnemos during the next three years at $1.50 per share or the market price, whichever is lower.

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Registrations cancelled later than April 5 are subject to a $50.00 service charge. Registration may be transferred at no charge.

SPECIAL REPORT

Micros in Big Business

In the April 29th Computerworld Special Report we'll report on management strategies for integrating micros into corporate information systems; offer users' experiences with micros; discuss the emergence of the Personal Computing Manager; provide overviews of business-related microcomputer hardware, applications software, and systems software; look into security risks; and examine how large MIS/DP organizations are networking their micros.

If you market business-related micro products, tell Computerworld's 600,000 readers in the April 29th issue. Our readers are heavily involved in the purchase of business-related micros, services, and supplies. For example, our subscribers at end-user organizations are personally involved in purchase decisions for the following products:

Product	Percent involved in purchase decisions
Microcomputers	84%
Local area networks	75%
Micro-peripherals	74%
Portable personal computers	75%
Floppy disks and diskettes	83%

Our subscribers at vendor organizations are equally influential — especially when you consider that they often buy in quantity:

Product	Percent involved in purchase decisions
Microcomputers	57%
Micro-peripherals	52%
Portable personal computers	34%
Floppy disks and diskettes	43%

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NICKELS AND DIMES

An agreement licensing **Xerox Corp.** to use **Savin Corp.'s** Landa III Electroink technology for a variety of copying and printing applications has been signed. The agreement calls for an immediate payment by Xerox of $18 million, which could escalate to as much as $26 million in the first year, depending upon the commercial uses that Xerox decides to make of the technology. Additional payments will be made to Savin upon commercialization of the process.

■

The Society of Manufacturing Engineers (SME) has announced the opening of its Center for Professional Development, a hands-on, state-of-the-art learning facility at SME's world headquarters. Designed primarily to train manufacturing managers, the center will offer classroom instruction in computer-integrated manufacturing management. The center is the latest addition to the SME's broad range of continuing education services for manufacturing engineers.

■

Seven industry pioneers have been named to the Information Processing Hall of Fame, which has been established at **Infomart** in Dallas. The new Hall of Fame recognizes the most significant scientific, technological and business contributions made by individuals in the information processing industry.

The first seven members are **Dr. John von Neumann,** the mathematician who promoted the advantages of binary numbers in computer construction; **John Mauchly** and **J. Presper Eckert,** codevelopers of the Eniac system that incorporated many of the components of modern computers; **Commodore Grace Hopper,** developer of the Cobol computer language and a leading technological exponent; **Gene Amdahl,** considered the father of high-end plug-compatible computers; **Jack St. Clair Kilby,** inventor of the integrated circuit; and **Sen. Frank Lautenberg,** founder of the first major worldwide computer service company.

■

Wicat Systems, Inc. an

See **SUPER** page 118

Industry directory published

DALLAS — Bob McGrath & Co., an executive recruiting firm based here, has announced the publication of a biannual directory of more than 4,000 sales and marketing personnel in the computer industry.

The first issue of "Who's Where? Sales and Marketing Management in the Computer Industry" includes the names of field management personnel from IBM, Wang Laboratories, Inc. and other large vendors.

The directory is said to list the names and business addresses of management personnel from 1,500 computer companies. It is priced at $30.

Bob McGrath & Co. has published the "IBM Alumni Directory" since 1971.

Comlease '85 set for fall

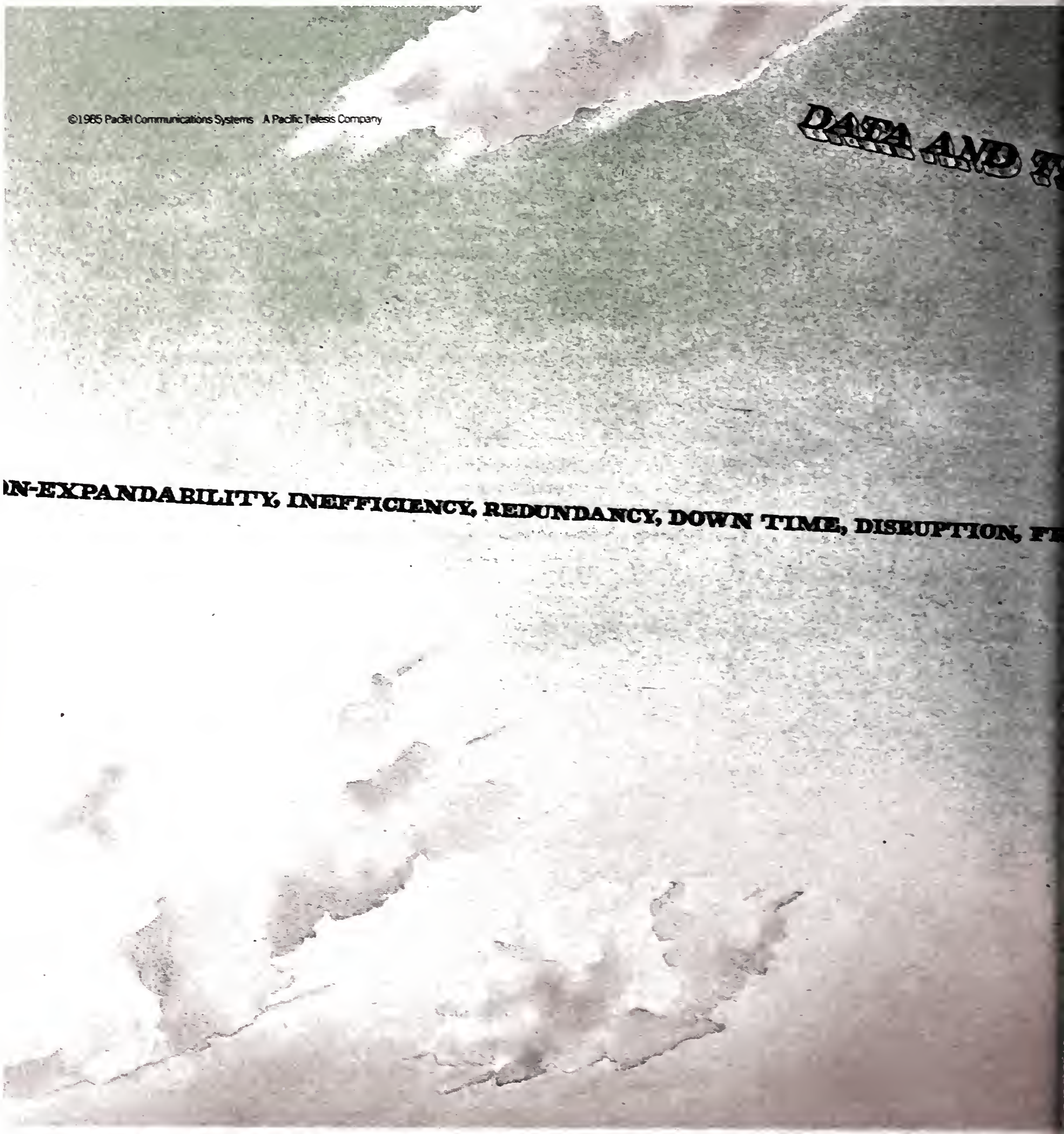
FALLS CHURCH, Va. — The Information Exchange will sponsor Comlease '85, a computer leasing conference and exposition scheduled for Sept. 30 through Oct. 2 at the Marriott Marquis Hotel in New York.

Comlease will provide computer leasing companies with the opportunity to present their products and leasing options to financial and DP executives.

The conference program will include addresses by industry leaders, panel discussions between computer users and leasing experts and special speakers to be announced.

Space rate for exhibitors is $15.50 per square foot. Final payment to the Information Exchange is due by April 2.

Information can be obtained from Comlease at 3825-1 South George Mason Drive, Falls Church, Va. 22041.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SLOW

from page 107

those products in automatic test equipment applications, such as the oil and semiconductor industries.

"We've been slowing in those domestic markets for some months," Steinkrauss said. "We felt it initially in our smaller customer base — commercial OEMs and industrial distributors. During the current quarter, that trend has continued and become a little more pervasive."

Steinkrauss said DEC has not felt the downturn among CAD/CAM and CAE users, government customers, scientific and technical users and technical OEMs.

Hewlett-Packard Co., which has seen its second-half 1984 slowdown continue into 1985, said its sluggish sales are an across-the-board phenomenon, with the exception of brisk first-quarter peripherals business in printers and plotters.

"We feel this is an economy-based slowdown," HP spokeswoman Barbara Kommer said. "A lot of [customers] with good growth last year did a lot of ramping up and are now slowing down. We're being very, very cautious about predicting a pickup."

Other vendors, however, are echoing IBM, which expressed optimism for the full year in its recent first-quarter announcement.

"We're doing a big volume of orders for the Venus [DEC's high-end VAX-11 8600 supermini], and our new products anticipated for the next quarter are moving along on schedule," DEC spokesman Steinkrauss said. "We are well poised to participate in a resurgence."

Analyst Thomas Crotty of the Stamford, Conn.-based Gartner Group agreed that user caution should mean only a temporary slowdown for the major vendors.

CDC

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reductions, which will include management personnel, and no deadline has been established.

Burning the midnight oil

"It will be a matter of the managers analyzing and then reporting what they might be able to do. It certainly is a prime project. . . . There will be some midnight oil burned around here in the next few days and weeks," the spokesman added. CDC will hold its annual shareholders meeting on May 1.

CDC said it does not expect a good first quarter and has experienced shipment rescheduling and partial orders cancellation for peripherals products. It also said sales were poor in the first quarter and overall negative trends in the computer industry contributed to problems. Analysts had recently projected negligible earnings for the first quarter.

”

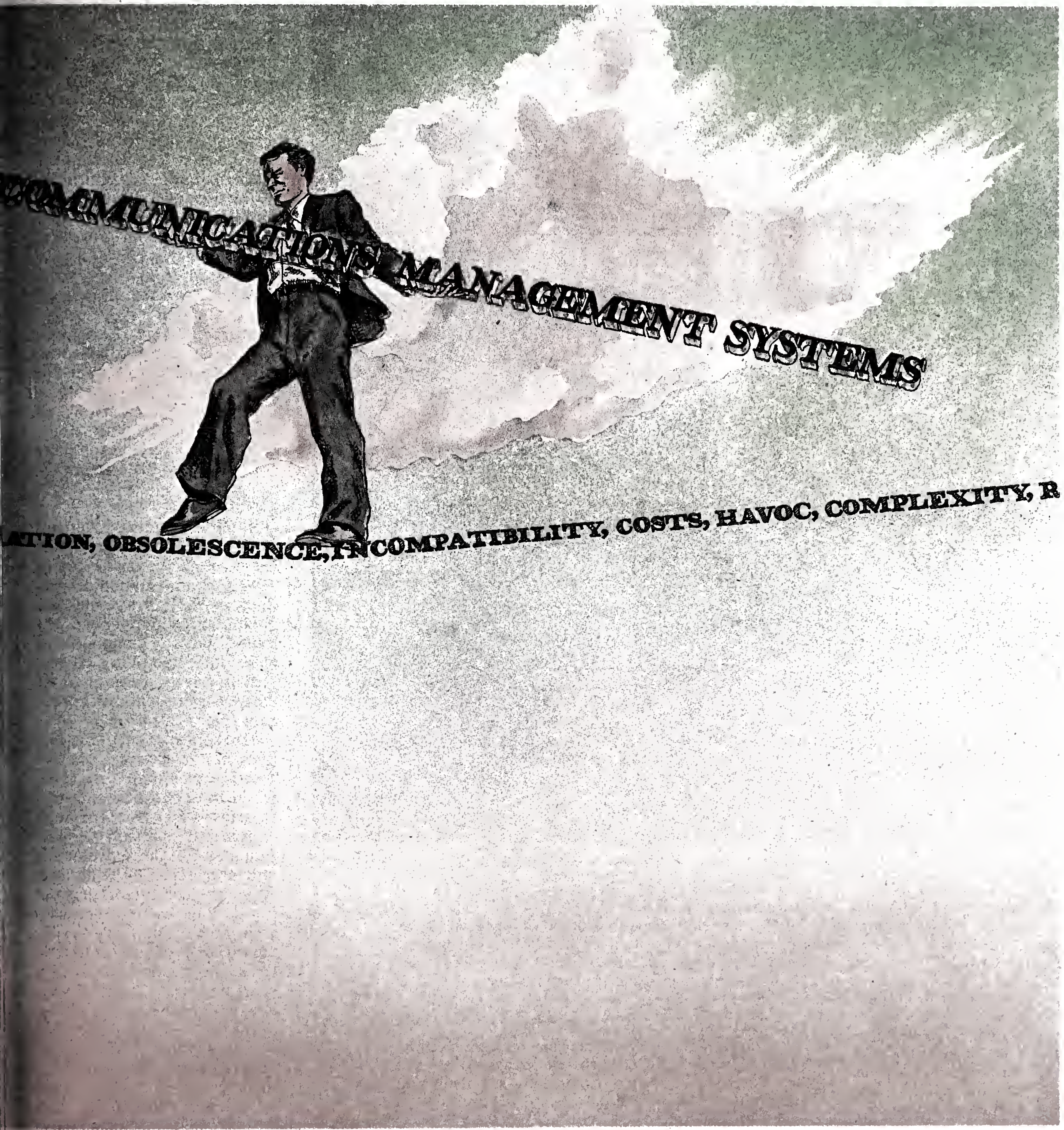
'If gradual processes fail, there will be some terminations.'

— CDC spokesman

The Ohio savings and loan bank crisis could cost CDC $21.4 million, the amount that its Commercial Credit Co. unit had contributed to Ohio's state insurance fund for thrift deposits. That fund was depleted when the Home State Savings Bank in Cincinnati collapsed in March. Commercial Credit owns the second-largest thrift in Ohio, the City Savings and Loan Association.

"The state officials are making their determination now about how they want to handle the fund in relation to the problems with Home State Savings, and until they do that and make their levies on the [insurance] fund, we won't know exactly where we stand," the spokesman said.

The company declined to say what business assets it would seek to sell; last year, CDC invited bids for the entire Commercial Credit unit. The spokesman said CDC will reduce "assets and businesses that no longer have a strategic fit, [as well as] some nonessential real estate."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SUPER

from page 116

nounced a license agreement with **IBM,** granting IBM the rights to market certain newly developed Wicat educational software. The license is exclusive to IBM for a limited period of time. Financial terms were not disclosed, but according to Dustin Heuston, Wicat chairman, "revenues from this contract will begin immediately and will impact Wicat's current quarter; in addition, Wicat expects to realize ongoing revenues from this contract for several years."

■

Yourdon, Inc., a New York-based corporation, and **Cadware Group Ltd.,** a New Haven, Conn., firm, announced the formation of a partnership to be known as the **Yourdon Software Engineering Co.** The joint venture will be providing personal computer-based design tools utilizing structured techniques to the software engineering market.

■

Boeing Computer Services Co. graduated its first class of artificial intelligence students at company headquarters in Bellevue, Wash. The group, made up of nine employees from various Boeing companies, completed one year of academic study and research in the AI field. Boeing started its own university-level program last year when it was unable to hire enough AI experts to diffuse the new technology throughout the company.

■

Litton Industries, Inc. and a group of private investors have signed a letter of intent for the purchase of Litton's Itek Graphics Systems division. The prospective purchasers are **Adlinger & Co.** and a group of the Itek division's senior management led by **R. Patrick Forster.** Terms of the proposed transaction were not disclosed.

SLUMP

from page 107

Earlier this year, Intel announced the layoff of 900 workers — about 4% of its work force — after predicting that first-quarter sales would be down as much as 25% from the $416 million recorded in the fourth quarter [CW, March 4].

At the annual meeting, Moore said that although customers are still flushing out excess chip inventories, first-quarter income will be stronger than predicted earlier in the year. Orders are increasing and the current quarter will be better than expected, Moore and other executives said.

Moore asserted that the industry's prolonged slowdown was due to an overly enthusiastic venture capitalist community that funded too many personal computer and disk drive operations during the boom years of 1983 and early 1984.

He said that 40 personal computer manufacturers each thought they would capture 20% of the market and ordered chips based on that premise. Now that the shakeout in the personal computer and peripherals market has begun, Moore said, Intel is paying the price for the excess ordering.

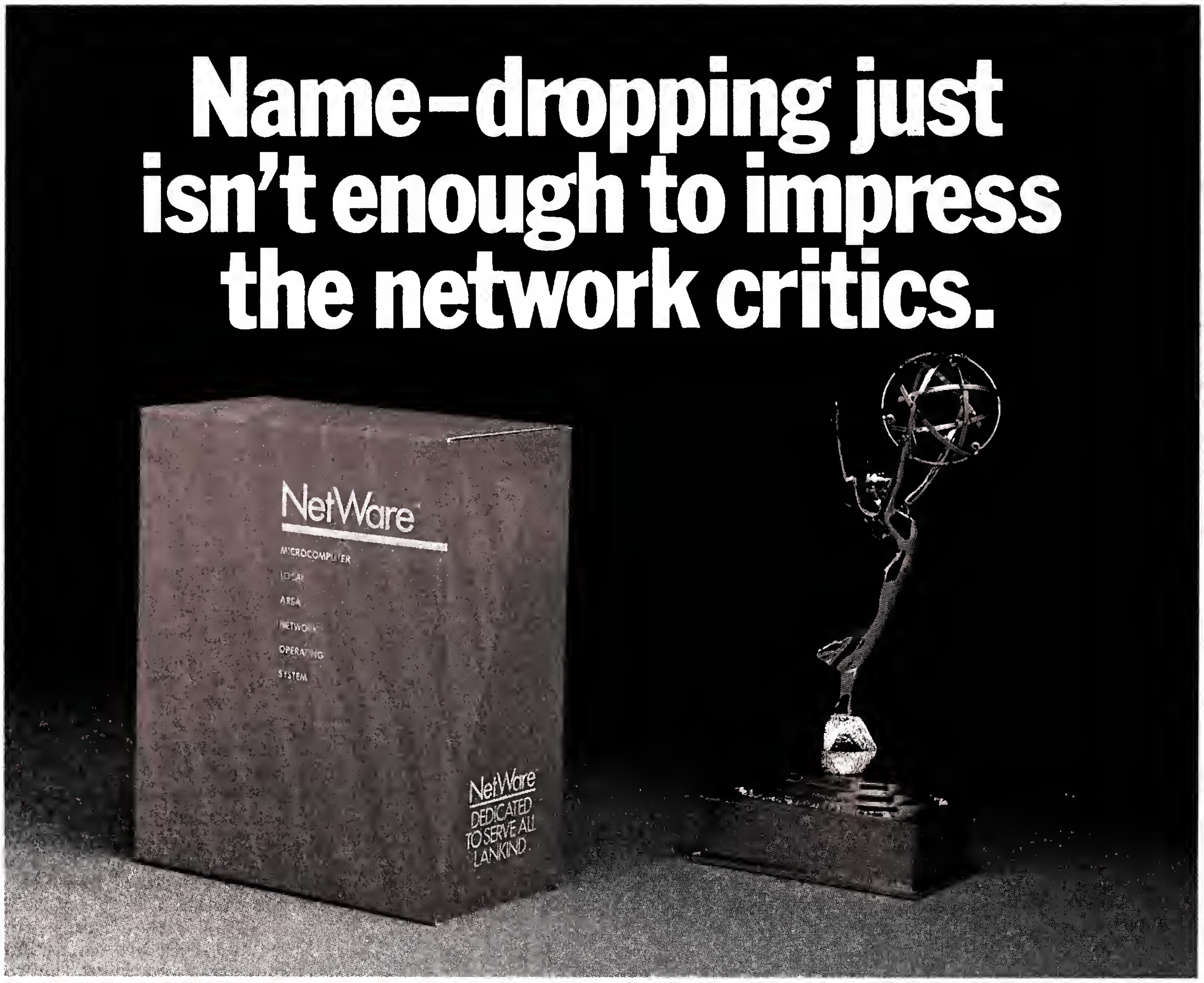
Judgment error

Intel President Andrew Grove said Intel made a similar error in judgment during 1984 when it ramped up production for its System 310 computer, which ended the year with disappointing sales. Intel had to lay off several hundred workers in its computer operation earlier this year as a result.

Grove said the industry's present slowdown differs from the slump in 1982, when Intel chose to cut staff salaries rather than furlough workers. Grove said the current slump is more prolonged and impacts several nonuniform semiconductor product lines. "The earlier recession was shorter and more evenly balanced over all products, so it was easier to keep people," he said. "The problems are different now and require a different solution."

Grove said that Intel spent approximately $500 million to increase manufacturing capacity during 1984, and will spend approximately the same amount on capacity increases this year. Grove said the expansion is required to keep pace with Japanese and Korean semiconductor manufacturers who will flood the market with semiconductor products this year.

Moore said the increased capacity will generate $1 billion to $1.5 billion in revenue for Intel during the next three years. However, he said, if the recession extends longer than forecast, the firm will have to borrow money to finance the capacity.



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Relocation assistance is available.

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- VM, DOS and VTAM communications experience
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- CICS internals and externals
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This challenging position offers an excellent salary/benefits package and continuing opportunity for career development. For additional information, call (814) 261-6292 or direct your resume, including salary requirements to:

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Manager, Salaried Employment
BROCKWAY, INC. (NY)
McCullough Avenue, Brockway, PA 15824
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We are presently expanding our technical areas to meet the increasing demand for our software products and are seeking qualified professionals with the following backgrounds:

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Should have 2+ years experience with MVS/XA internals. Familiar with JES II internals and IBM communications.

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Candidate should be familiar with RASTER graphics and JES II internals.

PROGRAMMERS/ ANALYSTS

Candidates must have a minimum of 3+ years experience programming in COBOL with CICS (COMMAND or MACRO Levels).

PROGRAMMERS/ ANALYSTS

Individuals must possess 3+ years experience in the design and programming of business applications using PL/1. Experience in IMS DB/DC, Data Dictionary, TSO/SPF, OS/MVS helpful.

PROGRAMMERS/ ANALYSTS

Ideal candidates will have 3+ years experience using "C" Language and UNIX or XENIX Operating Systems.

PROGRAMMERS/ ANALYSTS

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- Philadelphia, PA
- Los Angeles, CA
- North & Central N.J.
- Washington, D.C.

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If you are interested in a challenging position with professional career growth, please submit resume, in confidence, to:

Jan Ackerman
Auxton Computer Enterprises, Inc.
Dept. C48
851 Trafalgar Court
Suite 300 W
Maitland, FL 32751

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(213) 386-6805

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Mark David or Tim Smith
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Minneapolis, MN 55402
(612) 339-9001

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SR ANALYST/PROG

CT corp expanding on-line sys devel projs! Min 2+ yrs COBOL gen bus apps bkgrd w/desire to move into analysis. Co sponsored training prog in IMS & CICS. Relo paid. To **$30,000**

SYSTEMS PROGRAMMER

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DATA BASE CONSULTANTS

Nat corp w/growing market seeks indiv's w/strong data base bkgrd. (IMS, IDMS, TOTAL etc). Oppty's nationwide for those seeking growth & fin'l rewards. To **$50,000 + bonus**

S/38 RPG III

Area oppty's for all lvls — mgrs, S/A's. P/A's w/exp in S/38, RPG III environ. Apps incl MAPICS, fin's, distribution & hospital. Relo paid. **$25-50,000**

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of Hartford
111 Pearl Street
Hartford, CT 06103
(203) 278-7170

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6243 IH 10 West, Ste. 850
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Lge mfr seeks Sr S/A w/ strong IBM S/38 bkgrd. Indiv will assist in the installation of IBM S/38 Model 8 & Order Distribution apps devel. Solid user, communications & proj leadership abilities. Degree in Computer Science desired. MBA a + **$36,000**

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of Providence
900 Turks Head Building
Providence, RI 02903
(401) 274-8700

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IMS DB/DC

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Our facilities represent one of the most advanced computer complexes in the country. Security Pacific offers highly competitive salaries and benefits, excellent working conditions, and state-of-the-art technology. For confidential consideration, please send resúme and salary requirements to:

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Attn: Manager, Human Resources
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Framingham, MA 01701

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SYS/38 PROGRAMMER/ANALYST

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We are installing a new IBM System/38 in a multi-plant environment with enthusiastic users who are hungry for more information and tools.

The ideal candidate will have 2 to 5 years P/A experience, including 1 to 3 years RPG III and CL. Degree and manufacturing systems experience preferred.

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Marietta, Georgia 30063
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Qualifications include 3-5 years systems analysis experience with a DBMS in an on-line environment and multiuser operating systems. Demonstrated supervisory experience, including systems staff development, budgetary and planning skills, is required as is a bachelor's degree with preference for a liberal arts emphasis. Familiarity with fourth generation languages is helpful as will be experience with HP3000 systems and HP150 microcomputers.

Apply by sending your resume, including salary history, to **Director of Personnel, The University of the South, Sewanee, Tennessee 37375.**

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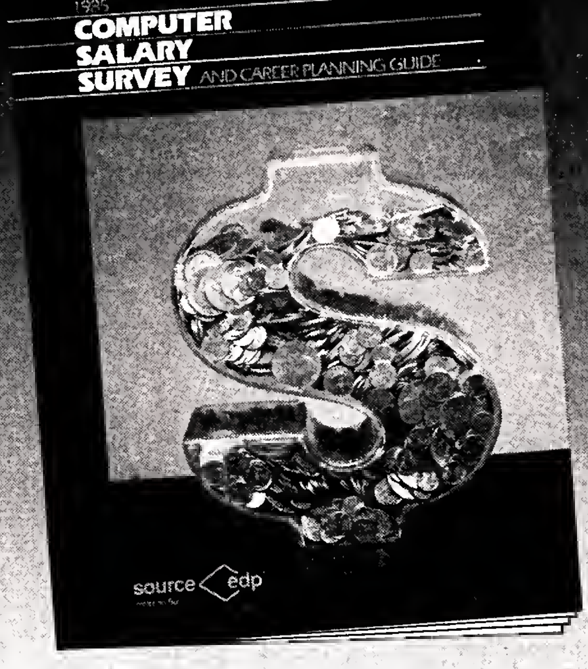

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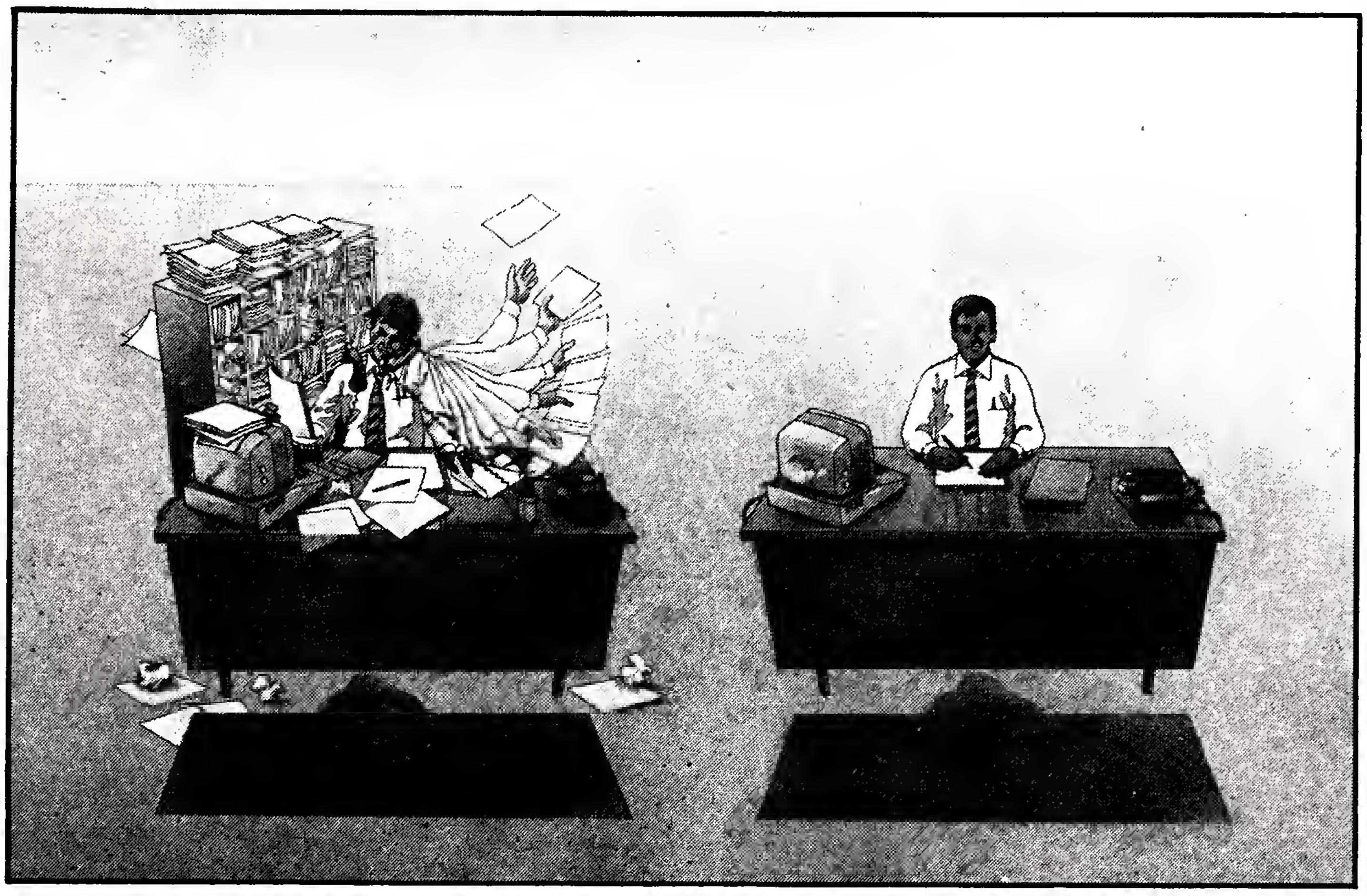

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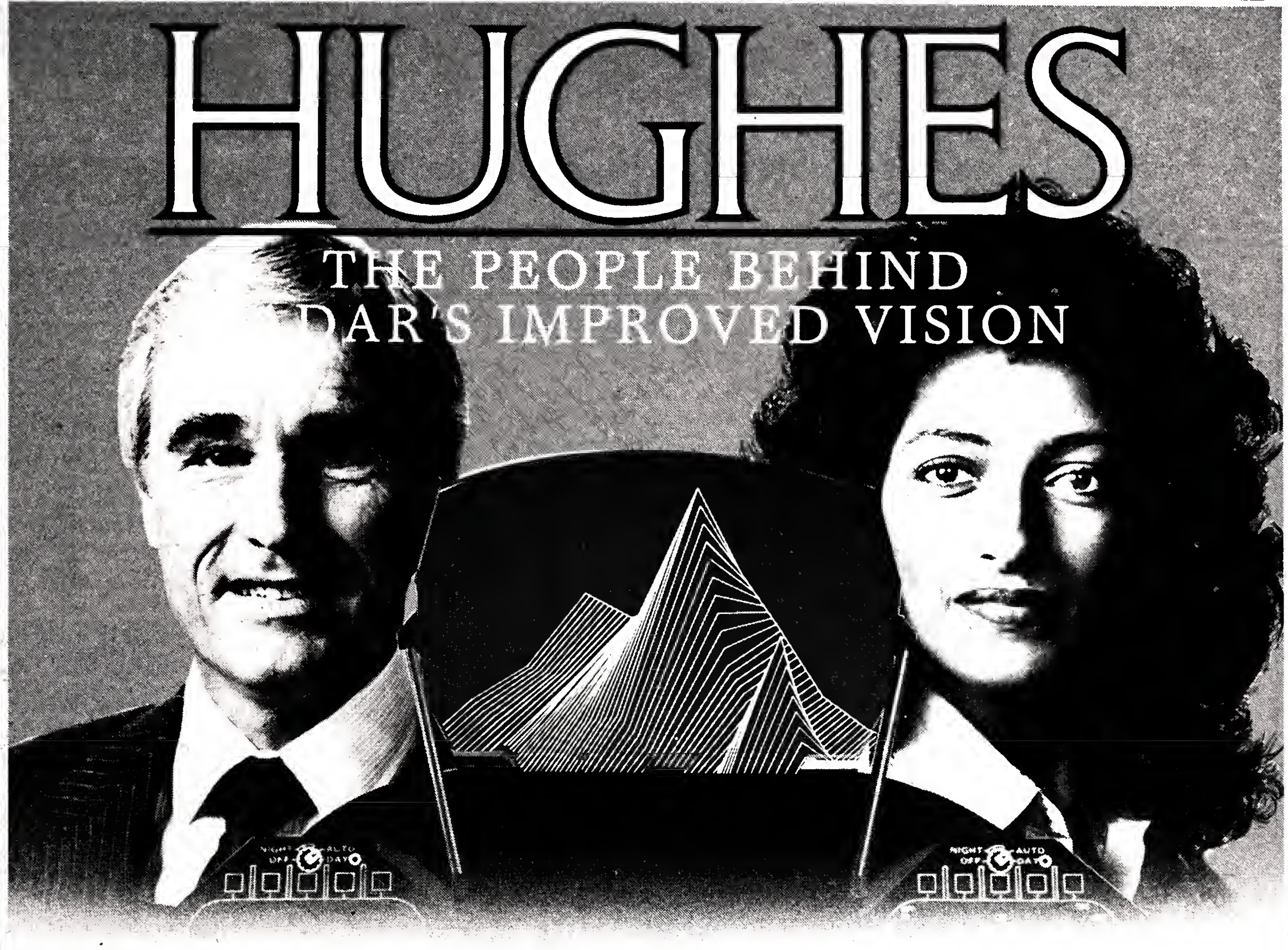

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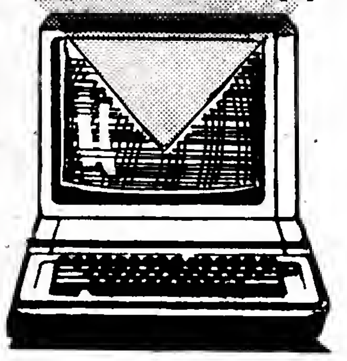

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We offer a competitive starting salary and benefits package. For confidential consideration, please send resume with salary requirements to: **Barbara Felender, Technical Recruitment, Union Bank Computer Center, Dept. CW 4/8, 605 W. Olympic Blvd., Los Angeles, CA 90015.** An Equal Opportunity Employer MFHV.

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Department of Human Resources
UNIVERSITY OF NEBRASKA MEDICAL CENTER
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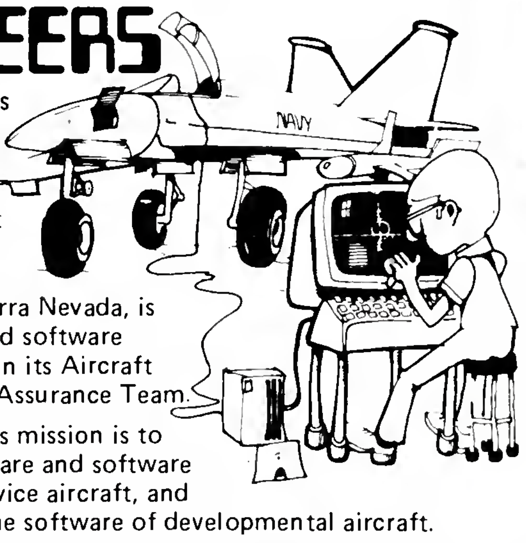

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Part of the Center's mission is to develop new software and software revisions for in-service aircraft, and test and validate the software of developmental aircraft.

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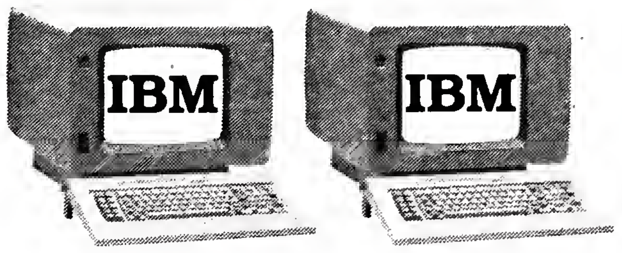

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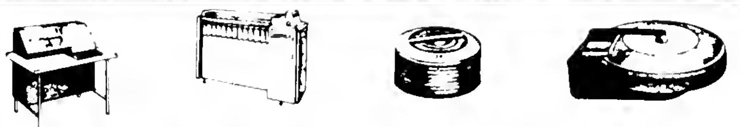

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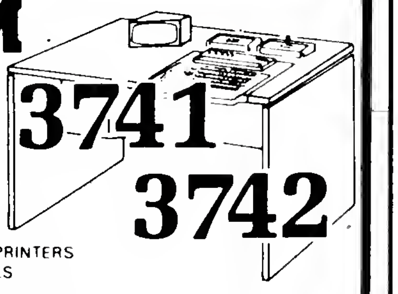

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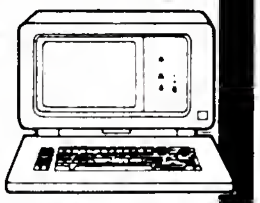

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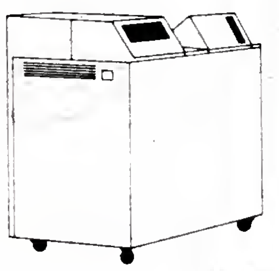

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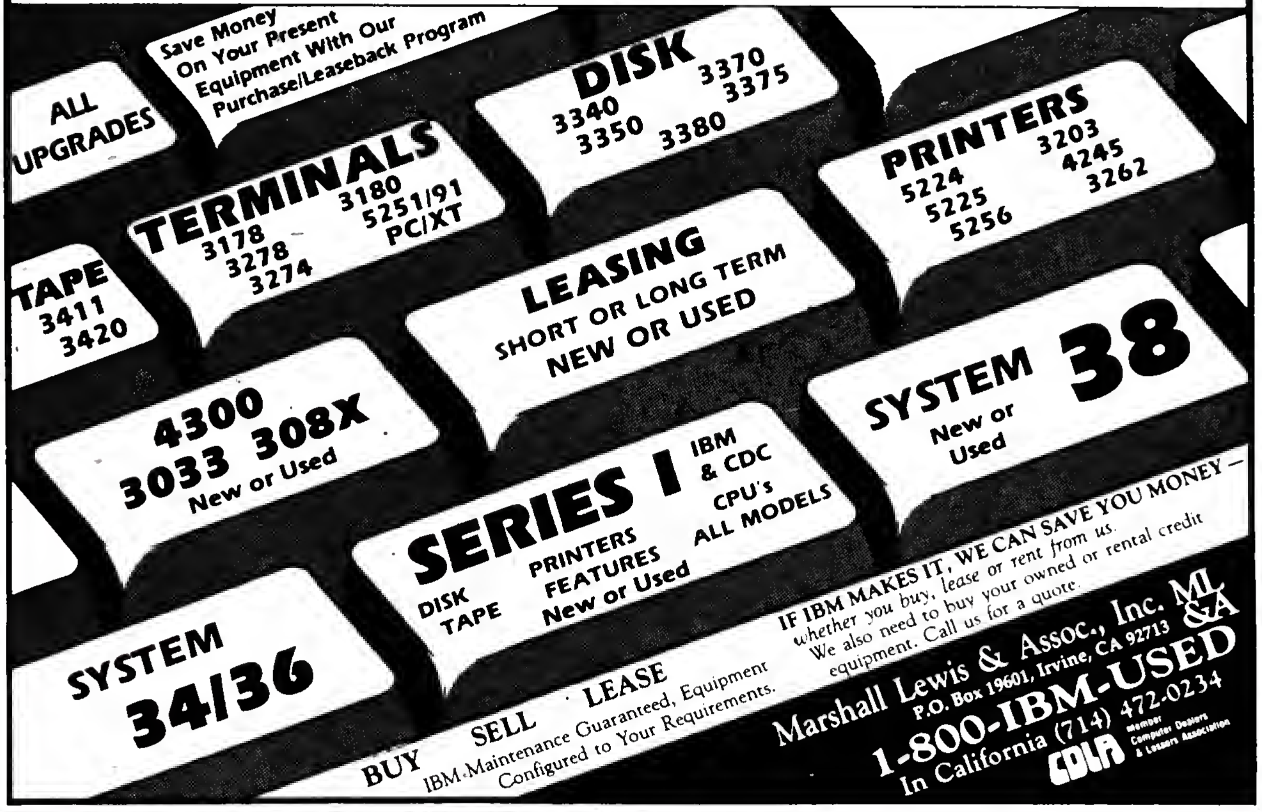

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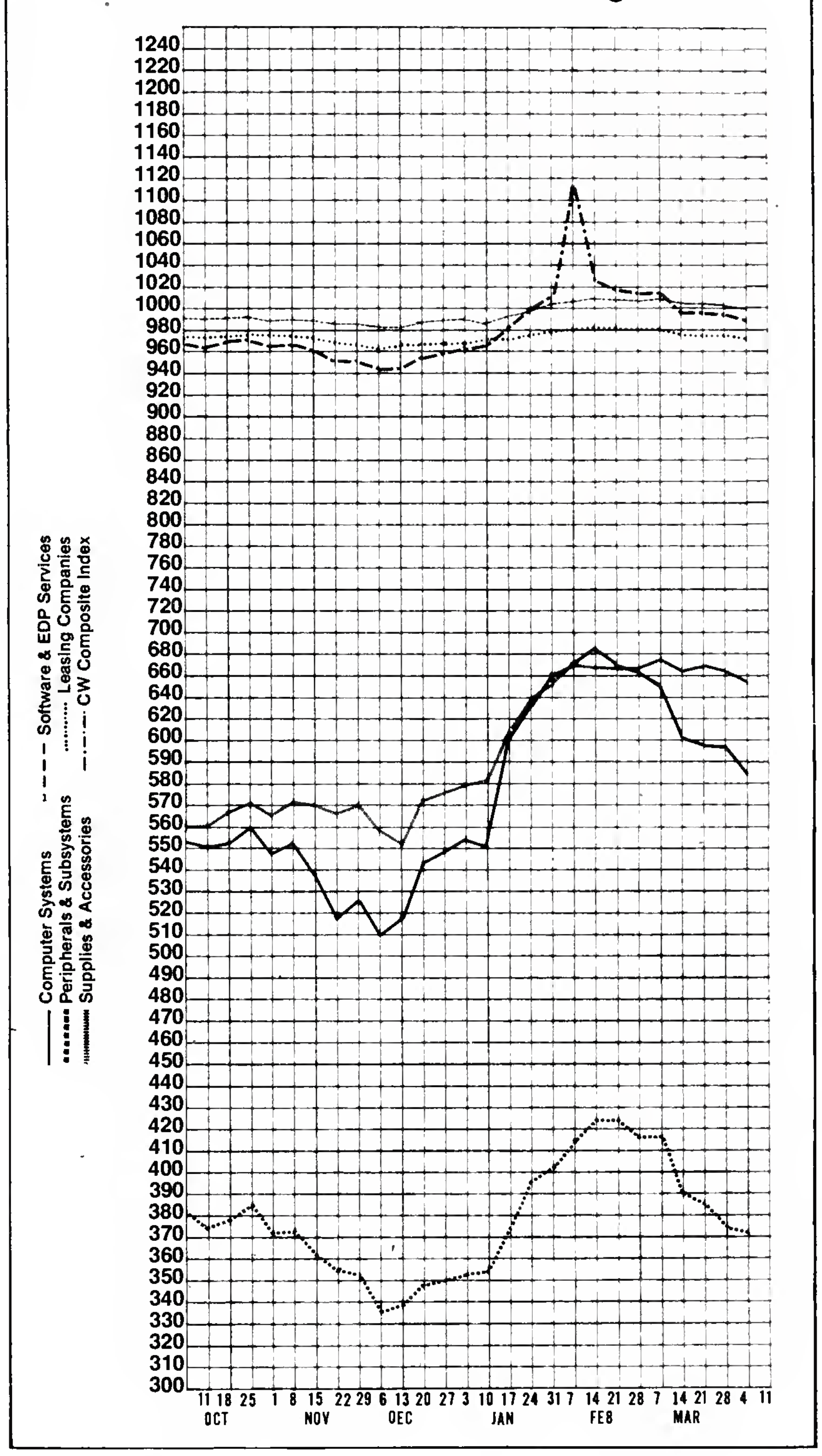
Computerworld Stock Trading Index



Computerworld Stock Trading Summary

TRADE QUOTES

CLOSING PRICES WEDNESDAY, APRIL 3, 1985

All statistics compiled, computed and formatted by TRADE QUOTES, INC Cambridge, Mass 02139

EXCH		PRICE 1984-85 RANGE (1)	CLOSE APR 3 1985	WEEK NET CHNGE	WEEK PCT CHNGE
	COMPUTER SYSTEMS				
D	ALPHA MICROSYSTEMS	6- 24	7	+ 1/2	+7.6
O	ALTOS COMPUTER SYST	7- 21	10 3/8	-1 3/8	-11.7
A	AMDAHL CORP	10- 19	14 7/8	+ 7/8	+6.2
O	APPLE COMPUTER INC	18- 63	21	- 7/8	-4.0
N	AT&T	15- 22	20 3/4	- 7/8	-4.0
N	BURROUGHS CORP	48- 64	59 1/8	+ 1/8	+0.2
D	COMPAD COMPUTER CP	4- 15	7 5/8	- 1/4	-3.1
O	COMPUTER AUTOMATION	3- 17	7 7/8	- 1/8	-1.5
A	COMPUTER CONSOLES	8- 20	7 3/4	+ 1/4	+3.3
N	CONTROL DATA CORP	25- 39	30 3/4	+ 7/8	+2.9
O	CONVERDENT TECHNOL	5- 41	8 1/4	- 7/8	-9.5
N	CRAY RESEARCH INC	39- 79	66	- 1/8	-0.1
O	DAISY SYSTEMS CORP	14- 36	27 1/2	-3	-9.8
N	DATA GENERAL CORP	39- 74	43 3/E	-1 1/4	-2.8
N	DATAPOINT CORP	13- 26	16	-2 1/4	-12.3
N	DIDITAL EDUIPMENT	77-125	102	-1 3/8	-1.3
A	EECO INC	12- 16	14 5/8	0	0.0
N	ELECTRONIC ASSOC.	3- 7	4 3/8	0	0.0
N	FLOATING POINT SYST	13- 31	26 5/8	+ 3/8	+1.4
N	FOXBORO	26- 36	27	+ 3/4	+2.8
O	GENERAL AUTOMATION	5- 16	5 7/8	- 1/8	-2.0
N	GOULD INC	20- 32	23 1/8	+ 3/8	+1.6
N	HARRIS CORP	23- 35	27 1/4	- 3/4	-2.6
N	HEWLETT-PACKARD CO	31- 44	33 1/2	- 3/4	-2.1
N	HONEYWELL INC	46- 69	58 5/8	+ 3/8	+0.6
N	IBM	99-137	126 1/2	+ 1/8	0.0
O	IPL SYSTEMS INC	1- 14	2 5/8	- 1/4	-8.6
N	ITT CORP	21- 42	35 1/8	+ 5/8	+1.8
N	M/A-COM INC	13- 24	18 7/8	- 1/8	-0.6
N	MANAGEMENT ASSIST	3- 29	3 1/4	- 1/8	-3.7
N	MATSUSHITA ELEC(ADR)	52- 81	59 1/4	-3 3/4	-5.9
N	MODULAR COMPUTER SYS	6- 10	6 3/4	- 1/8	-1.8
N	MOHAWK DATA SCI	6- 17	6 3/8	-1 1/2	-18.0
N	MOTOROLA INC	29- 44	33 1/4	- 1/4	-0.7
N	NAT'L SEMICONDUCTOR	11- 17	11 1/4	+ 1/8	+1.1
N	NBI INC	13- 24	14 3/8	+ 1/8	+0.8
N	NCR	21- 31	27 1/4	-1 1/8	-3.9
N	PERKIN-ELMER	18- 30	25	+ 1/4	+1.0
N	PRIME COMPUTER INC	11- 20	16	+ 5/8	+4.0
N	SPERRY CORP	35- 54	51 1/2	+ 3/4	+1.4
O	STRATUS COMPUTER INC	8- 17	14 1/4	-1 3/8	-8.7
O	TANDEM COMPUTERS INC	15- 40	19 7/8	-2 1/2	-11.1
N	TANDY CORP	24- 37	33 1/2	+ 3/4	+2.2
O	TELEVIDEO SYSTEMS	3- 41	2 3/4	- 1/8	-4.3
O	TELXON CORP	8- 20	20	+ 3/4	+3.8
N	TEXAS INSTRUMENTS	101-150	110 3/4	-1 7/8	-1.6
A	ULTIMATE CORP	10- 24	11 1/8	- 1/4	-2.1
O	VECTOR GRAPHICS INC	0- 9	1/2	- 1/16	-8.9
A	WANG LABS "B"	18- 32	18 3/8	- 5/8	-3.2
A	WANG LABS "C"	18- 32	18 3/4	- 5/8	-3.2
N	XEROX CORP	35- 46	43 1/8	0	0.0
	LEASING COMPANIES				
O	BOOTHE FINANCIAL CP	10- 22	20 1/4	- 1/4	-1.2
A	CNI CORP	4- 10	8 1/8	- 5/8	-7.1
N	COMDISCO INC	8- 17	15 1/2	0	0.0
O	CONTINENTAL INFO SYS	5- 16	8 3/8	+ 3/4	+9.8
N	DPF INC	10- 17	15 7/8	- 1/4	-1.5
D	FINALCO GROUP INC	4- 12	3 5/8	- 3/8	-9.3
D	PHOENIX AMERICAN INC	3- 17	2 5/8	- 1/4	-8.8
O	SELECTERM INC	8- 21	9 1/4	0	0.0
N	U.S. LEASING	28- 44	38 7/8	- 3/8	-0.9
	COMPONENTS				
N	ADVANCED MICRO DEV	25- 41	31 7/8	- 3/4	-2.2
O	ADV'D SEMICONDUCTOR	14- 38	14 1/4	-1 1/2	-9.5
N	ANALOG DEVICES INC	20- 32	25 5/8	- 1/4	-0.9
O	ANALOGIC CORP	10- 31	12 1/2	- 5/8	-4.7
N	APPLIED MAGNETICS CP	9- 21	12 3/8	- 7/8	-6.6
O	HADCO CORP	5- 12	4 3/4	0	0.0
D	MICRO MASK INC	8- 18	8 3/8	- 1/8	-1.4
N	TERADYNE	22- 35	22 5/8	- 1/8	-0.5

EXCH: N=NEW YORK; A=AMERICAN; P=PACIFIC; B=BOSTON;
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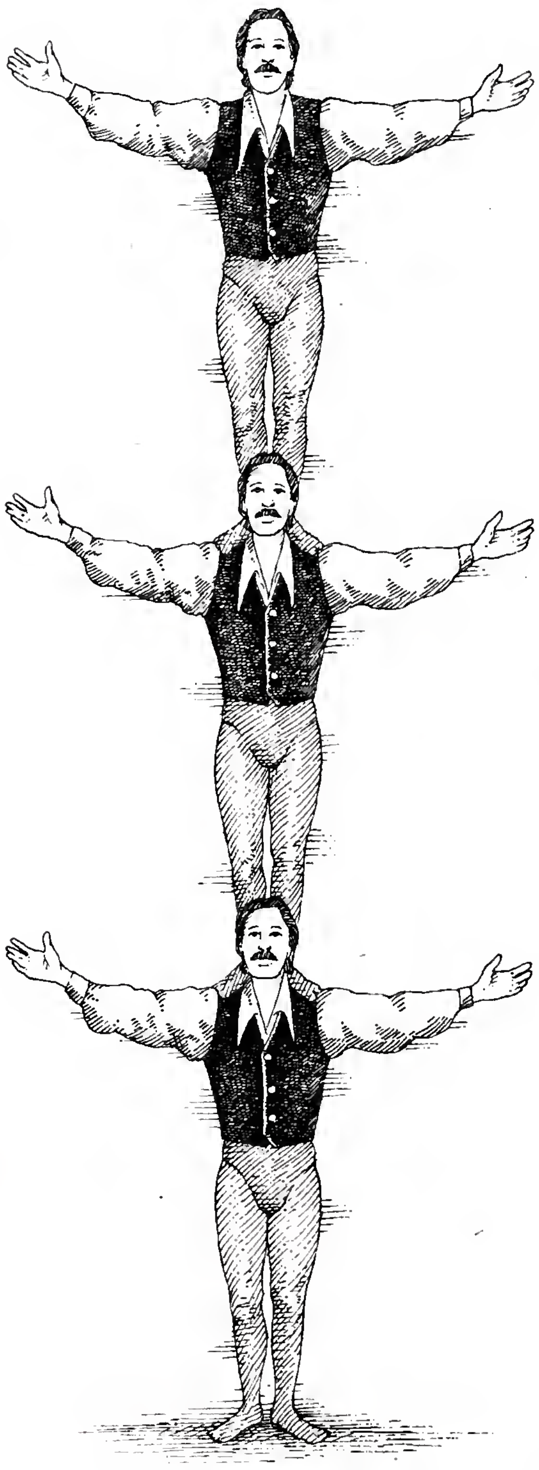
(1) TO NEAREST DOLLAR.

EXCH		PRICE 1984-85 RANGE (1)	CLOSE APR 3 1985	WEEK NET CHNGE	WEEK PCT CHNGE
	SOFTWARE & EDP SERVICES				
O	ADVANCED COMP TECH	2- 8	2 1/2	+ 1/8	+5.2
N	ADVANCED SYSTEMS INC	9- 22	11 1/2	+ 3/4	+6.9
O	AGS COMPUTERS INC	10- 32	12	-1 1/4	-9.4
O	AMERICAN SOFTWARE	12- 31	19	- 1/2	-2.5
N	ANACOMP INC	1- 5	3 1/2	+ 1/8	+3.7
O	ANALYSTS INTL CORP	5- 17	8 1/8	- 1/8	-1.5
A	APPLIED DATA RES	18- 38	29 3/8	+ 1/2	+1.7
O	ASHTON TATE	6- 15	8 3/4	+ 1/4	+2.9
O	ASK COMPUTER SYSTEMS	13- 24	16 1/2	-4 1/4	-20.4
B	ASTRADYNE COMP IND	1- 7	2 1/8	0	0.0
N	AUTOMATIC DATA PROC	30- 46	44 5/8	+1 1/4	+2.8
O	COMPUTER ASSOC INT'L	15- 35	23 3/4	-2	-7.7
O	COMPUTER HORIZONS	8- 20	7 7/8	- 7/8	-10.0
O	COMPUTER NETWORK	5- 11	7 3/4	- 1/4	-3.1
N	COMPUTER SCIENCES	11- 17	15 1/4	+ 3/8	+2.5
O	COMPUTER TASK GROUP	12- 21	18 3/4	- 7/8	-4.4
O	COMPUTER USAGE	1- 18	1 1/4	0	0.0
O	COMPUTONE SYSTEMS	4- 23	8 1/2	- 5/8	-6.8
O	COMSERV CORP	1- 16	3 1/4	- 1/4	-7.1
O	COMSHARE	6- 14	8 3/4	+ 1/4	+2.9
N	CULLINET SOFTWARE	12- 33	26 1/4	-1 3/4	-6.2
O	CYCARE SYSTEMS INC	16- 27	23	- 1/2	-2.1
O	HOGAN SYSTEM INC	6- 27	5 1/2	- 1/2	-8.3
N	GENERAL ELECTRIC CO	48- 65	60 3/8	+ 3/8	+0.8
N	GTE CORP	36- 45	40 3/4	- 3/8	-0.9
N	INFORMATICS GENERAL	14- 24	17 3/4	- 1/8	-0.6
O	INFORMATION SCIENCE	3- 17	2 3/4	- 3/4	-21.4
O	INFOTRON SYSTEMS CP	15- 43	21 3/4	-1 3/4	-7.4
O	KEANE ASSOCIATES	6- 15	14	+ 1/4	+1.8
A	LOGICON	18- 34	33 3/4	- 1/4	-0.7
O	LOTUS DEVELOPMENT CP	15- 40	25 1/2	-3 5/8	-12.4
O	MCI COMMUNICATIONS	6- 28	9 3/4	+1	+11.4
O	MNGT SCI AMER INC	9- 33	10 7/8	- 5/8	-5.4
O	MATHEMATICAL APP GRP	6- 18	5 1/2	- 1/2	-8.3
O	MICOM SYSTEMS INC	27- 50	27 1/2	+ 1/4	+0.9
O	MICROPRO INT'L CP	2- 10	2 7/8	0	0.0
O	NATIONAL DATA CORP	8- 26	10 5/8	+ 3/8	+3.6
O	ON-LINE SOFTWARE INT	4- 29	6 1/4	0	0.0
O	PANSOPHIC SYSTEMS	11- 30	17	-1	-5.5
N	PLANNING RESEARCH	10- 15	11 1/2	+ 1/8	+1.0
O	POLICY MGMT SYSTS CP	22- 35	26 1/2	+ 1/4	+0.9
O	PROGRAMMING & SYS	4- 8	5 3/8	0	0.0
O	REYNOLDS & REYNOLD	28- 53	37	- 1/4	-0.6
O	SEI CORP	11- 34	19	+1 1/4	+7.0
O	SHARED MEDICAL SYST	23- 43	29 3/4	- 1/8	-0.4
O	SCIENTIFIC COMPUTERS	5- 14	6 3/8	+ 1/4	+4.0
O	SOFTWARE AG	9- 21	14 3/8	- 1/4	-1.7
N	URS CORP	10- 14	11 1/2	+1 1/8	+10.8
N	UCCEL	7- 17	13 1/4	- 1/2	-3.6
	PERIPHERALS & SUBSYSTEMS				
P	AM INTERNATIONAL	2- 7	3 7/8	- 1/8	-3.1
A	ANDERSON JACOBSON	3- 11	3 3/8	0	0.0
O	AST RESEARCH INC	7- 20	17	-1 5/8	-8.7
O	AUTO-TROL TECHNOLOGY	8- 29	9	-1 1/4	-12.1
O	AVANT-GARDE COMPUTNG	11- 29	12	+ 1/4	+2.1
O	BANCTEC INC	5- 22	10 3/4	+ 1/4	+2.3
A	BEEHIVE INT'L	1- 7	1 1/8	0	0.0
N	BOLT.BERANEK & NEW	17- 30	26	0	0.0
O	CAMBEX CORP	1- 3	1 5/8	0	0.0
N	CENTRONICS DATA COMP	4- 14	4 1/2	- 1/4	-5.2
A	CETEC CORP	7- 12	6 7/8	+ 1/8	+1.8
A	COGNITRONICS	4- 8	5	+ 3/8	+8.1
N	COMPUGRAPHIC CORP	26- 37	31 5/6	+ 3/8	+1.1
O	COMPUTER TRANSCEIVER	1- 10	1	0	0.0
N	COMPUTERVISION CORP	16- 46	16 3/8	-4 1/4	-20.6
N	CONRAC CORP	11- 17	13 1/4	+ 1/8	+0.9
A	DATAPRODUCTS CORP	13- 26	13 3/4	+ 5/8	+4.7
A	DATARAM CORP	4- 12	5 5/8	- 3/8	-6.2
O	DATA SWITCH CORP	5- 41	5 1/2	- 3/8	-6.3
O	DATUM INC	5- 17	7 1/8	- 3/8	-5.0
O	DECISION DATA COMPUT	9- 19	15 3/4	+ 1/2	+3.2
O	DOCUTEL-OLIVETTI	3- 39	5 1/8	+ 1/8	+2.5
N	ELECTRONIC M & M	5- 8	8 3/4	+ 1/8	+1.4
O	ENDATA, INC	5- 16	5 1/4	+ 1/2	+10.5
O	EVANS & SUTHERLAND	11- 50	13	+ 1/8	+0.9
O	GANDALF TECHNOLOGIES	8- 14	8 1/8	- 1/8	-1.5
N	GEN'L DATA COMM IND	13- 20	14 3/8	+1	+7.4
N	HAZELTINE CORP	23- 33	26 1/4	- 1/8	-0.4
O	ICOT CORP	3- 8	4 7/8	- 1/8	-2.5
O	INFORMATION INTL INC	10- 19	13 1/2	0	0.0
O	INTECOM INC	6- 21	5 3/4	+ 1/8	+2.2
O	INTEL CORP	25- 45	27 1/2	+1	+3.7
A	LUNDY ELECTRONICS	7- 13	12 5/6	+ 1/8	+1.0
O	MEGADATA CORP	3- 8	6	+ 1/4	+4.3
A	MSI DATA CORP	9- 19	9 1/2	0	0.0
N	NASHUA CORP	19- 29	25 1/4	- 3/4	-2.8
O	NETWORK SYSTEMS CORP	16- 34	23 1/2	-2	-7.8
N	NO AMERICAN PHILIPS	30- 45	39 1/8	+ 1/4	+0.6
N	NORTHERN TELECOM LTD	30- 42	34 1/4	- 3/4	-2.1
O	OMEX	1- 6	1/8	0	0.0
N	PARADYNE CORP	11- 18	12 7/8	- 3/8	-2.8
A	PENRIL CORP	9- 14	12	- 3/8	-3.0
N	PLESSEY CO (ADR)	20- 35	22 7/8	- 3/8	-1.6
O	PRINTRONIX INC	13- 34	14	-1 1/2	-9.6
O	RAMTEK CORP	4- 23	4 5/8	0	0.0
N	RECOGNITION EQUIP	10- 17	11 5/8	-1 5/8	-12.2
N	SANDERS ASSOCIATES	32- 51	37 3/4	+1 1/4	+3.4
O	SCAN-TRON CORP	9- 19	12 7/8	0	0.0
N	SCIENTIFIC ATLANTA	8- 14	10 3/4	0	0.0
O	SEAGATE TECHNOLOGY	4- 20	7	+ 1/4	+3.7
N	STORAGE TECHNOLOGY	2- 12	3	+ 1/8	+4.3
O	SYKES DATATRONICS	1- 13	1	-	-5.9
A	T BAR INC	7- 11	8	+ 5/8	+8.4
A	TAB PRODUCTS CO	13- 20	18 1/2	+ 1/2	+2.7
O	TANDON CORP	6- 35	5 5/8	- 1/8	-2.1
A	TEC INC	8- 12	11	+ 1/2	+4.7
N	TEKTRONIX INC	52- 68	58 1/2	+ 1/2	+0.8
N	TELEX	19- 47	39 1/4	-1 5/8	-3.8
O	TESDATA SYSTEMS CP	2- 17	1 1/2	- 1/4	-14.2
N	TIMEPLEX INC	13- 23	16 7/8	- 1/4	-1.4
O	VISUAL TECHNOLOGY	2- 26	1 3/4	- 1/8	-6.6
	SUPPLIES & ACCESSORIES				
N	AMERICAN BUS PRODS	17- 27	26 7/8	+1 3/4	+6.9
N	BARRY WRIGHT	21- 33	22 1/2	-1 1/4	-5.2
A	DUPLEX PRODUCTS INC	22- 31	30 1/2	+ 1/2	+1.6
N	ENNIS BUS. FORMS	18- 38	34 3/8	- 1/4	-0.7
N	3M COMPANY	69- 86	81 3/8	0	0.0
N	MOORE CORP LTD	35- 53	50 3/8	-2 1/8	-4.0
O	STANDARD REGISTER	27- 57	55 1/2	-1	-1.7
N	WALLACE COMP SERVICE	23- 38	32	-2 7/8	-8.2



OF THE BIG THREE IN BUSINESS SOFTWARE TODAY, WHO'LL BE ON TOP TOMORROW?

If you look at the big three, you see that each of us has a fast growth rate, and each claims to have "total-solution" software. A multiplicity of packages that give you complete mainframe capability, plus a PC link.

But whose total solution is best? If you agree that success is the reward for a job well done, you may agree with the prediction we make at McCormack & Dodge.

The company that's on top tomorrow will be the company that's on top of your business problems today. With the solutions that are easiest to apply—the solutions that promise the fewest future headaches.

When you're talking "total solution," this can mean only one thing. The product line that works best as a totality will be the easiest and most effective for all parties. User and vendor alike.

We believe your own analysis will quickly point out which of the big three has the most integrated family of products. Even though all three claim total integration.

We believe you'll find that two companies offer the mere appearance of integration. An agglomeration of business applications linked superficially, through hinges, patches, shadow files and masks.

While one offers the real thing. Millennium. A true family of business software in which the whole works as smoothly as any part. In which every package has the same query mechanism, the same report writers, the same screen generation, the same on-line documentation, security and real-time capabilities. So that when the packages are put together, there are absolutely no borders between them. They fit like pieces in a jigsaw puzzle. Making the most efficient use of all your data processing resources.

There's even a Millennium application development tool, so you can create new systems as you need them. Without slow, expensive programming.

Of the big three in software today, who'll be on top tomorrow?

Don't stop asking until you know.

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